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CORRECTIVE ACTION PLAN FOR
ATLANTIC RICHFIELD COMPANY
ARCO Facility #5350
3804 Plaza Drive
Oceanside, California
Unauthorized Release #H20645-001

April 21, 2005
SECOR Project No. 08BP.05350.05

Prepared by:

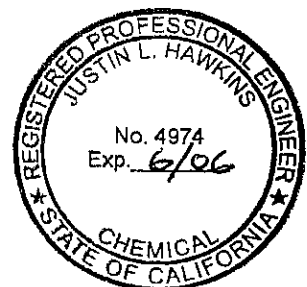
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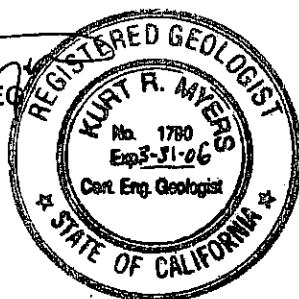


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1.0 INTRODUCTION

SECOR International Incorporated (SECOR), on behalf of Atlantic Richfield Company, has prepared this Corrective Action Plan (CAP) for ARCO Facility #5350 located at 3804 Plaza Drive, in Oceanside, California (Figures 1 and 2). The CAP was requested by the County of San Diego Department of Environmental Health, Site Assessment and Mitigation Program (SAM), in a letter dated December 8, 2004. The CAP provides a summary of assessment information for the site and an evaluation of, and recommendations for, remediation of hydrocarbon-impacted soil and groundwater at the site. The CAP has been prepared in general accordance with the SAM Manual (2004) and the requirements of California Code of Regulations Title 23, Division 3, Chapter 16, Article 11.

2.0 SITE BACKGROUND

2.1 SITE IDENTIFICATION

- a) Site Address: ARCO Facility #5350
3804 Plaza Drive
Oceanside, California 92056
- b) Current Site Use: Gasoline Service Station/Retail Store (ARCO Facility #5350)
- c) Assessor's Parcel No.: 168-012-17-00
- d) Property Owner: BP West Coast Products, LLC
c/o P&T Tax Department
P.O. Box 512485
Los Angeles, CA 90051
- e) Responsible Party: Atlantic Richfield Company
4 Centerpointe Drive
La Palma, CA 90623
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- h) SAM Site #: #H20645-001

2.2 SITE DESCRIPTION AND USAGE

ARCO Facility #5350 is located at 3804 Plaza Drive, Oceanside, California, approximately one-quarter mile east of College Boulevard (Figure 1). The site is an active gasoline station and AM/PM mini-mart, consisting of a building, four gasoline pump islands covered by a canopy, and parking areas (Figure 2). The site is bound on the north by State Highway 78 and to the south by Plaza Drive, beyond which is a retail shopping center. The site is bound on the east and west by fast food restaurants.

A review of the 1967 (photorevised 1975) U.S. Geological Survey San Luis Rey, California quadrangle 7.5-minute topographic map indicates that the site lies at an elevation of approximately 200 feet above mean sea level (MSL). Surface water runoff from the site and surrounding properties discharges into storm drains located along Plaza Drive.

2.3 GEOLOGY

The area is underlain by mostly non-marine, Tertiary-age, pale gray to white sandstone, clayey sandstone, clayey siltstone, and claystone (California Division of Mines and Geology, 1982).

Based on soil boring logs from drilling at the site, subsurface materials beneath the site consist primarily of poorly-graded and well-graded sand, silty sand, and clayey sand. Lithologies encountered during site assessment are included on boring/well logs (Appendix A). Geologic cross-sections locations are presented in Figure 3 and cross-sections are presented in Figures 4 through 6.

2.4 HYDROGEOLOGY

The site lies within the El Salto Hydrologic Subarea (HSA) of the Buena Vista Creek Hydrologic Area of the Carlsbad Hydrologic Unit. Groundwater in this HSA has been designated as having existing beneficial uses for municipal and agricultural supply, and potential beneficial use for industrial supply (California Regional Water Quality Control Board [CRWQCB], 1994). A summary of beneficial groundwater and surface water uses is included as Table 1.

Water level measurements from the monitoring wells on January 20, 2005 indicate that water beneath the site occurs between approximately 7 and 15 feet bgs (Table 2). Groundwater beneath the site flows to the south at a gradient of 0.05, as shown in Figure 7. Hydrographs showing fluctuations in groundwater elevations over time are included as Appendix B.

2.5 LIMITED RECEPTOR SURVEY

SECOR conducted a limited receptor survey that included identifying adjacent property use, surface water bodies and groundwater production wells within one-half mile of the site, and sensitive wildlife habitats in the site vicinity.

2.5.1 Adjacent Properties

Retail properties are found in the site vicinity. The site is bound on the north by State Highway 78 and to the south by Plaza Drive, beyond which is a retail shopping center. The site is bound on the east and west by fast food restaurants. No schools are located within one half-mile of the site.

2.5.2 Groundwater Production Wells

The local water purveyor, Oceanside Water Utilities Department (OWUD), obtains most of its potable water for the area from the San Diego County Water Authority (SDCWA), which obtains most of its supply from the Colorado River via the Colorado River Aqueduct project. OWUD has stated that they do not have, nor do they have plans to install, any production wells in the site vicinity (OWUD, 2005).

SECOR reviewed publicly available information and conducted an area reconnaissance to identify water wells within one-half mile of the subject property. Data sources included Banks Information Solutions Inc. (2004; Appendix C), State of California Department of Water

Resources Bulletin No. 106-2, the California State Water Resources Control Board GeoTracker™ website, and the USGS water well data website. Due to security restrictions, SECOR could not access detailed information on the GeoTracker™ database. No wells within one half-mile of the subject property were identified in the search.

2.5.3 Surface Water

The site is located approximately 800 feet north of Buena Vista Creek. Buena Vista Creek flows westward into Buena Vista Lagoon, approximately 2.7 miles west of the site. A small water body to the west of the site was identified on the USGS San Luis Rey, California Quadrangle topographic map. However, this water body could not be identified during the area reconnaissance. No other surface water bodies were identified within one-half mile of the site.

2.5.4 Environmentally Sensitive Receptors

Buena Vista Creek is designated by the CRWQCB as having beneficial uses for human and wildlife use (Table 1; CRWQCB, 1994). Based on information gathered from the U.S. Environmental Protection Agency (EPA) Interim Measures Bulletins Website and the USGS San Luis Rey, California quadrangle topographic map, no endangered or threatened species were identified within the same Township, Range, and Section as the subject site (EPA, 2005).

Based on a review of the California Department of Fish and Game (CDFG) IMAPS website, the northwestern boundary of the Carlsbad Highlands Ecological Reserve is located approximately 1.2 miles southeast of the site (CDFG, 2005).

2.6 PREVIOUS ENVIRONMENTAL ACTIVITIES

On December 5, 2000, SECOR collected nine soil samples following removal of dispensers and product lines. The samples were analyzed for full carbon range total petroleum hydrocarbons (TPH). The two samples with the highest TPH concentrations were also analyzed for the fuel oxygenates methyl tert-butyl ether (MTBE), ethyl tert-butyl ether (ETBE), tert-amyl ether (TAME), di-isopropyl ether (DIPE), and tert-butanol (TBA). Laboratory analytical results indicated five of the nine soil samples contained detectable TPH concentrations (Table 3). Both of the soil samples analyzed for fuel oxygenates contained MTBE and TBA (SECOR, 2001). Based on these results, site assessment was requested by the SAM.

On July 23, 2001, a SECOR geologist supervised the drilling of three soil borings to depths of approximately 35 feet below ground surface (bgs) each. The soil borings were completed as groundwater monitoring wells MW-1, MW-2, and MW-3 (Figure 2). Laboratory analysis indicated the presence of TPH as gasoline (TPHg) in concentrations above the laboratory reporting limit of 10 milligrams per kilogram (mg/kg) in one of 21 soil samples submitted for analysis. Various benzene, toluene, ethylbenzene, total xylenes (BTEX) compounds were present in eleven of 21 soil samples. MTBE was detected in six soil samples submitted for analysis during this phase of assessment. Laboratory analysis of groundwater samples indicated that TPHg, TBA and BTEX compounds were detected in the sample from well MW-2. MTBE was detected in groundwater samples collected from all wells (SECOR, 2002).

On August 28, 2002, a SECOR geologist supervised the drilling of three soil borings to depths of approximately 31 feet bgs each. The soil borings were completed as groundwater monitoring wells MW-4, MW-5 and MW-6 (Figure 2). Various BTEX compounds were present in two soil samples. MTBE was detected in ten soil samples submitted for analysis during this phase of assessment. Laboratory analytical results of groundwater samples indicated that TPHg was detected in the samples from wells MW-5 and MW-6 and BTEX compounds were detected in the sample from MW-6. MTBE was detected in all wells (SECOR, 2003).

On July 7, 2004, SECOR supervised the drilling and installation of three groundwater monitoring wells (MW-7, MW-8 and MW-9) near the subject site (Figure 2). The well borings were each drilled to a depth of approximately 27 feet bgs. No hydrocarbon constituents were detected above laboratory reporting limits in any of the soil or groundwater samples collected and analyzed from MW-7, MW-8, and MW-9 during this phase of assessment (SECOR, 2004).

A summary of historical soil sample analytical results is presented in Table 3 and Figure 3.

Groundwater monitoring has been conducted at the site since 2001. Based on groundwater sample analytical results collected to date, the limits of the dissolved benzene and MTBE plumes are effectively defined within practical limits. Benzene and MTBE concentrations appear to be generally decreasing over time in wells with the highest reported concentrations (MW-2, MW-5, and MW-6). Benzene and MTBE concentrations have not been detected in the most downgradient well (MW-9); therefore it does not appear that the dissolved benzene and MTBE plumes are migrating. Historical groundwater gauging data, groundwater sample analytical data, and additional oxygene data are included as Tables 2, 4, and 5, respectively.

On January 20, 2005, SECOR collected additional groundwater samples during the first quarter 2005 monitoring and sampling event for analysis of baseline remediation by natural attenuation (RNA) indicator parameters. The RNA data were used to evaluate whether or not natural attenuation of petroleum hydrocarbons is occurring at the site. Dissolved oxygen (DO), oxidation-reduction potential, pH, specific conductance, and temperature were measured using a downhole instrument and recorded on a field data sheet (Appendix D). Groundwater samples were analyzed for nitrate (as nitrogen) and sulfate by EPA Method 300.0, total iron by EPA Method 6010B, ferrous iron by EPA Method 6010B-dissolution, and methane by RSK 175. Copies of the laboratory analytical report and chain-of-custody documentation for the January 20, 2005, RNA groundwater sampling event are presented in Appendix D. A summary of the baseline RNA indicator parameter analytical results and field measurements is presented in Table 6. TPHg, BTEX, and MTBE analytical results from the first quarter 2005 groundwater sampling event are also included in Table 6 for comparison. The data presented in Table 6 shows that areas at the site with relatively higher petroleum hydrocarbon concentrations coincide with areas with higher ferrous iron and methane concentrations, and lower oxidation-reduction potentials, and lower DO, nitrate, and sulfate concentrations. This suggests that biodegradation of dissolved petroleum hydrocarbons at the site is occurring via aerobic respiration, denitrification, sulfate reduction, ferric-iron reduction, and methanogenesis.

3.0 ASSESSMENT OF IMPACTS

The purpose of this section is to (1) identify the contaminants of concern (COCs) present at the site; (2) discuss the chemical, physical, toxicological and environmental fate/transport characteristics of the COCs; and (3) describe the extent of COC impact to soil, groundwater, surface water, air and subsurface utilities at and near the site.

3.1 CONTAMINANTS OF CONCERN

Available information regarding past and present UST operations at the site indicates that the USTs were (and are) used for storing gasoline. Accordingly, laboratory analytical test methods during the site assessment activities addressed gasoline-related hydrocarbons and additives. Diesel-range hydrocarbons were detected in soil samples collected in 2000. Because diesel has reportedly not been stored or sold at the site, the diesel-range detections may be attributed to weathered gasoline. Laboratory analysis of soil and groundwater samples during assessment identified gasoline as the principal COC at the site. Gasoline-related COCs that have been identified during the site investigation include TPHg, BTEX, MTBE, TBA, and several detectable analytical results for TAME in soil and/or groundwater.

3.2 CONTAMINANT CHARACTERISTICS

Key chemical, physical, environmental fate/transport characteristics and relevant regulatory levels of the COCs are summarized in Table 7. Additional information on the COCs is summarized below.

3.2.1 Gasoline

Gasoline is a clear liquid with a characteristic odor that is used as a fuel for internal combustion engines and is a solvent. Gasoline is a flammable liquid and has a low solubility in water. Gasoline vapors are also flammable and may flash if an ignition source is present. Gasoline contains chemicals which are hazardous to human health and may cause cancer (NJDHSS, no date). The primary COCs in gasoline that have been reported in samples from the site are discussed individually in the following paragraphs.

3.2.2 Benzene

Benzene is a colorless liquid with an aromatic odor. It is found in gasoline, is used in making other chemicals and is used as a solvent. Commercial use of benzene as a solvent is generally being phased out due to its toxicity. Benzene is flammable in liquid and vapor states and vapors may flash if an ignition source is present. Benzene is a carcinogen and mutagen which is readily absorbed through inhalation, ingestion and dermal pathways (NJDHSS, no date).

3.2.3 Toluene

Toluene is a colorless liquid with a sweet, strong odor. It is present in gasoline and used in making other chemicals, perfumes, dyes and detergents. Toluene is flammable in liquid and

vapor states and vapors may flash if an ignition source is present. Toluene exposure may damage a developing fetus (NJDHSS, no date).

3.2.4 Ethylbenzene

Ethylbenzene is a colorless liquid with an aromatic odor that is found in gasoline, used in the production of polymers and is used as a solvent. Ethylbenzene is flammable in liquid and vapor states, and vapors may flash if an ignition source is present. Long term exposure to ethylbenzene may cause damage to the liver. There is limited evidence that exposure to ethylbenzene may cause cancer or damage to a developing fetus (NJDHSS, no date).

3.2.5 Xylenes

Xylene isomers (meta-xylene, ortho-xylene and para-xylene) are clear liquids with strong odors. Xylenes are found in gasoline and used as solvents. Xylenes are flammable in liquid and vapor states, and vapors may flash if an ignition source is present. Long term exposure to xylenes may damage the liver and kidneys, and xylenes may damage a developing fetus (NJDHSS, no date).

3.2.6 Methyl tert-butyl ether

Methyl tert-butyl ether (MTBE) is a colorless liquid that has historically been used in gasoline as an octane booster and to reduce hazardous emissions from automobiles. MTBE is flammable in liquid and vapor states, and vapors may flash if an ignition source is present. Long-term exposure to MTBE may cause damage to the kidneys and is an animal carcinogen (Lyondell, 2003). The general use of MTBE in gasoline in the State of California was phased-out in 2003. The State of California considers MTBE a suspected human carcinogen based on carcinogenic effects observed in experimental animals (CalEPA, 1999).

3.2.7 Tert-Butanol

Tert-butanol (TBA) is an oily, colorless liquid or solid with a mothball-like odor. TBA is used as a solvent for pharmaceuticals, as a paint remover and as an additive in unleaded gasoline. TBA is flammable as a solid or liquid and poisonous gases may be produced in a fire. TBA is not listed as a carcinogen or known to adversely affect reproduction; however high levels of exposure to TBA may affect kidney and liver function and be a respiratory and dermal irritant (NJDHSS, no date).

3.2.8 Tert-amyl methyl ether

Tert-amyl methyl ether (TAME) is a colorless liquid that was historically used in gasoline as an octane booster and to reduce hazardous emissions from automobiles. TAME is flammable in liquid and vapor states, and vapors may flash if an ignition source is present. Adverse reproductive effects have been reported in animals. Chronic exposure will cause neurological degradation and/or abnormalities (Acros Organics N.V., 2002).

3.2.9 Fate, Transport and Persistence of Contaminants of Concern in the Environment

Chemical fate and transport in the environment is dependent on a variety of factors relating to the physical and chemical properties of the substance(s) released and the subsurface conditions at the release site. A full fate and transport analysis was beyond the scope of this document; however, a general discussion of fate and transport of the contaminants of concern is provided below. As discussed in the previous sections, benzene and MTBE are classified by the State of California as carcinogens and therefore represent the greatest potential risk to human health and the environment. Therefore, discussion of fate and transport and persistence in the environment will focus on these two compounds. Toluene, ethylbenzene, and xylene isomers are anticipated to behave similarly to benzene, while TBA and TAME are anticipated to behave more like MTBE.

A comparison of chemical properties of benzene and MTBE (Table 7) shows that MTBE is approximately 24 times more soluble in water than benzene and has a lower soil sorption coefficient (Koc). Therefore, when released into the environment MTBE is more likely to reach groundwater, and when in groundwater is more readily transported with groundwater flow.

Biodegradation and chemical oxidation commonly occur in the subsurface and may act to reduce COC concentrations over time. Biodegradation occurs when microorganisms in the subsurface consume a chemical under aerobic or anaerobic conditions. The extent of biodegradation that occurs is dependent on the types of microorganisms that are present, site-specific environmental conditions, and the presence of sufficient nutrients to support the microorganisms. Benzene is reported to be readily biodegradable under aerobic conditions in surface water with a half-life ranging from as little as two days to 17 days; however, aerobic degradation is expected to occur more slowly in groundwater. Benzene biodegradation does not occur as readily under anaerobic conditions.

MTBE is not a naturally occurring substance. As a result, MTBE biodegradation rates are typically low compared to refined petroleum products. Studies have shown that MTBE can biodegrade at low to moderate rates resulting in residual TBA, which in turn is easily mineralized to CO₂ and H₂O. Once benzene has been removed, degradation rates for MTBE typically increase (Wilson et al, 2000). Other studies have shown that MTBE-degrading aerobic microbes are relatively uncommon in the subsurface at most sites and that addition of special cultures and nutrients is necessary to encourage aerobic degradation of MTBE (Spinnler et al, 2001).

3.3 EXTENT OF HYDROCARBON IMPACTS TO SOIL

Historical soil assessment data indicates that two general areas that contain TPH or TPHg concentrations above 100 mg/kg. These areas are indicated on Figures 3 and 4. Brief descriptions of these hydrocarbon-impacted areas are presented in the following paragraphs. Comprehensive soil analytical results are presented in Table 3. Soil boring and soil sampling locations are presented on Figures 3 and 4.

Area 1 is characterized by TPHg concentrations above 100 mg/kg reported in soil samples collected south of the USTs (Figure 3, Area 1). In this area, one sample contained TPHg above the laboratory reporting limit (MW-2/15') at a concentration of 140 mg/kg (Table 3). The volume of hydrocarbon-impacted soil in this area is estimated to be approximately 590 cubic yards with a maximum thickness of approximately 10 feet (Figure 4).

Area 2 is characterized by TPH concentrations above 100 mg/kg reported in soil samples collected beneath the southeastern dispenser island (Figure 3, Area 2). The TPH concentrations reported in the soil samples collected in this area range from 170 to 500 mg/kg (Table 3). The volume of hydrocarbon-impacted soil in this area is approximately 91 cubic yards with an estimated thickness of approximately 5 feet (Figure 3).

3.4 EXTENT OF HYDROCARBON IMPACTS TO GROUNDWATER

Dissolved TPHg has been reported in groundwater samples collected from wells MW-2, MW-5, and MW-6 with the highest TPHg concentration of 52,000 µg/L (MW-2; July 21, 2004). Dissolved benzene and MTBE have been reported in groundwater samples collected from wells MW-1 through MW-6 with the highest benzene concentration of 4,200 µg/L (MW-5; January 9, 2003) and the highest MTBE concentration of 61,000 µg/L (MW-6; September 11, 2002). TPHg, benzene, and MTBE have not been reported above laboratory reporting limits in wells MW-1, MW-3, and MW-4 in sampling events during the last year. Additionally, TPHg, benzene, and MTBE have not been reported above laboratory reporting limits in downgradient wells MW-7, MW-8, or MW-9. Dissolved TBA has been reported in well MW-2, with the highest concentration 5,400 µg/L on December 20, 2001.

Based on groundwater sample analytical results collected to date, the limits of the dissolved benzene and MTBE plumes are effectively defined within practical limits. Benzene and MTBE concentrations appear to be generally decreasing over time in wells with the highest reported concentrations (MW-2, MW-5, and MW-6). Benzene and MTBE concentrations have not been detected in the most downgradient well (MW-9); therefore it does not appear that the dissolved benzene and MTBE plumes are migrating.

A summary of historical groundwater sample analytical results collected is included as Tables 4 and 5. TPHg, benzene, and MTBE concentrations from the first quarter 2005 are presented on Figure 8. Benzene and MTBE isoconcentration maps for the first quarter 2005, 2004, and 2003 monitoring events are shown on Figures 9, 10 and 11, respectively.

3.5 POTENTIAL FOR COC MIGRATION DUE TO SUBSURFACE UTILITIES

Man-made pathways for potential COC migration are located on site and in the site vicinity. The pathways are subsurface utilities that include cable, electricity, gas, phone, sewer, storm drain, and water conduits. Subsurface utility locations were identified from utility company information and utility markings from previous assessment work in the site vicinity. The depth of each utility could not be verified, although in general the subsurface utilities are buried in trenches at depths ranging from 1.5 to 8 feet bgs. General locations of subsurface utilities in the vicinity of the site are shown in Figure 12. Because depth to water beneath the site and vicinity ranges between

approximately 11 and 17 feet bgs, the subsurface utilities are not likely to act as migration pathways for hydrocarbons in groundwater.

3.6 EXPOSURE PATHWAYS

Based on existing site conditions, the only likely complete or potentially complete exposure pathways for the subject site are (1) ingestion of impacted groundwater; (2) vapor inhalation due to COC volatilization from impacted soil or groundwater below the site and adjacent sites; (3) impact to environmental receptors; (4) ingestion of impacted soil and dust; and (5) dermal contact with impacted soils. These exposure pathways are discussed below.

Groundwater in the site vicinity is not currently used for municipal supply. OWUD, the local water purveyor, has stated that they do not have plans to install production wells in the site vicinity (OWUD, 2005). During SECOR's sensitive receptor survey no public wells were identified within one-half mile of the site. Therefore, this exposure pathway is incomplete.

The presence of hydrocarbons, particularly benzene and MTBE, in soil and groundwater beneath the site represents a complete vapor inhalation exposure pathway. In this pathway the COCs volatilize from impacted soil and groundwater. The resulting hydrocarbon vapors then migrate vertically through the subsurface soil and asphalt or concrete surface into the breathing zone at the site. All known areas of soil and groundwater impact below the site are located approximately 50 to 60 feet away from any enclosed structures at the site (Figure 3). As a result hydrocarbon vapors that migrate to the surface would tend to become diluted with outdoor air and dispersed by winds. Therefore, for the existing site conditions and site use the level of risk posed by the vapor inhalation exposure route is low. If site use was to change and enclosed structures were to be placed over the hydrocarbon-impacted areas, then the level of risk due to this exposure pathway could increase.

Buena Vista Creek, located approximately 800 feet south of the site, is the nearest downgradient surface water receptor. Groundwater samples collected from the farthest downgradient well (MW-9; approximately 90 feet south the site) have not been impacted by petroleum hydrocarbons at levels above the laboratory reporting limit. Therefore, this pathway is incomplete.

During normal site operations, exposure to impacted soil and/or dust is unlikely to occur because the site is predominantly covered with asphalt and concrete. There is a potential for exposure during future work involving the disturbance of subsurface soil at the site or in the site vicinity. The potential for contaminant exposure during these activities can be minimized through worker safety training, dust control, and the use of personal protective equipment.

4.0 DETERMINATION OF APPLICABLE CLEANUP LEVELS

SECOR proposes soil and groundwater cleanup goals that are protective of human health and the environment.

4.1 SOIL

SECOR proposes soil cleanup goals that are protective of current and future beneficial groundwater uses and human health and safety. Specific numeric cleanup goals have not been developed for this site.

4.2 GROUNDWATER

To protect current and potential future beneficial uses of groundwater and surface water in the vicinity, long-term cleanup levels that are protective of human health and the environment will be applied. These long-term groundwater cleanup goals are presented in the table below:

Applicable Groundwater Cleanup Levels – Potential Future Use as Municipal Drinking Water Supply	
Chemical	Target Concentration (µg/L)
Benzene	1 – California primary maximum contaminant level (MCL)
Ethylbenzene	300 – California primary MCL
MTBE	13 – California primary MCL
TBA	12 – California State action level
Toluene	150 – California primary MCL
Xylenes	1,750 – California primary MCL

5.0 FEASIBILITY STUDY

The purpose of this section is to evaluate alternative site remediation strategies for appropriateness and cost-effectiveness. Based on the evaluation, the most appropriate and most cost-effective strategy is selected for implementation at the site. The main focus is the long-term protection of current and future beneficial groundwater uses in the area, with MTBE being the primary COC. The remedial strategy to be implemented will be chosen based on the following objectives (listed in order of importance):

1. Stop further migration of the MTBE groundwater plume.
2. Reduce the concentration of dissolved-phase hydrocarbons in the saturated zone to levels that are protective of current and future beneficial uses.
3. Reduce the source mass of hydrocarbons in vadose zone and capillary-fringe soil.

5.1 REMEDIAL TECHNOLOGY SCREENING

A list of proven remedial technologies (EPA, 1995) was screened for applicability at the site. A remedial technology screening matrix is presented as Table 8. Site-specific conditions that involve impact to soil and groundwater were considered for the initial screening of corrective action technologies. Technologies that passed the initial screening are listed below:

- Groundwater Extraction (GWE),
- Dual-Phase Extraction,
- Enhanced Bioremediation, and
- Natural Attenuation

5.2 REMEDIAL ALTERNATIVES

The remedial technologies that passed the initial screening were used to develop three remedial alternatives that, in SECOR's opinion, can best achieve the remedial goals. These alternatives are described below.

5.2.1 Alternative 1 – High-Vacuum Dual-Phase Extraction (HVDPE)

This alternative would utilize SECOR's Mobile Remediation System (MRS) to perform two 96-hour HVDPE events on monitoring well MW-3. SECOR's MRS extracts groundwater and soil vapor using a high-vacuum liquid-ring pump. The extracted liquid and vapor are separated within the MRS unit. Liquid is transferred to an aboveground storage tank for subsequent treatment and/or disposal. Soil vapors are subjected to thermal oxidation within a combustion chamber and released to the atmosphere in accordance with the requirements of the San Diego County Air Pollution Control District (APCD) permit for the MRS. This method is the most active of the three proposed alternatives and would be the most costly, at approximately \$45,000 to implement for remediation of the remaining dissolved concentrations (Table 9).

5.2.2 Alternative 2 - In-Situ Enhanced Bioremediation with Oxygen-Releasing Compound

Oxygen-releasing compound (ORC) produces molecular oxygen from magnesium peroxide when the substance is placed into the groundwater beneath the site. ORC can be injected as a slurry into the impacted groundwater zone using a direct-push or auger rig, and/or installed in existing wells in the form of socks. The increased dissolved oxygen stimulates naturally-occurring microorganisms that aerobically degrade hydrocarbon compounds. This alternative is a passive method and would be the second most costly, at approximately \$16,260 (Table 10).

5.2.3 Alternative 3 - Remediation by Natural Attenuation

Remediation by natural attenuation (RNA) is a passive remedial method that involves no active remediation. RNA is a multi-component process that incorporates biological mechanisms (biodegradation), chemical mechanisms (oxidation and hydrolysis), and physical mechanisms (dispersion, volatilization, and sorption). Groundwater monitoring data (Tables 4 and 5) show that dissolved MTBE concentrations have continued to decrease. This suggests that the remaining dissolved hydrocarbon concentrations in groundwater are currently being reduced through the processes of natural attenuation. Additionally, on January 20, 2005, SECOR collected and submitted groundwater samples for evaluation of baseline RNA indicator parameters. This evaluation suggested that RNA is occurring in groundwater below the site. RNA involves no further active remediation, and no further monitoring of groundwater. This remediation method is the most cost-effective of the three proposed alternatives at \$0 (Table 11).

5.3 SELECTED REMEDIAL ALTERNATIVE

A comparison of the advantages and disadvantages of the proposed alternatives is provided in Table 12. After comparing the three alternatives it appears that all of the proposed alternatives would result in an adequate level of protection of human health, and protect the environment and beneficial uses of groundwater and surface water in the vicinity of the site. Each alternative would effectively reduce the remaining hydrocarbons in the subsurface over time, and each alternative is easy to implement. Most other factors in the matrix are also nearly equal in terms of short and long-term effectiveness of remediation, and impact to the surrounding community.

Given that all three of the proposed alternatives would be effective in reaching the cleanup goals, the selection process is narrowed down to a cost comparison (Table 12). Based on cost considerations, RNA is the preferred remedial alternative for the remaining hydrocarbon impact at the site.

6.0 ESTIMATED TIME FOR GROUNDWATER CONDITIONS TO REACH CLEANUP GOALS

This section provides an estimate of the time required for groundwater concentrations below the site to reach State of California primary drinking water MCLs. It has already been demonstrated that the dissolved hydrocarbon plume below the site is shrinking and not migrating (Section 2.6 and 3.4). There are currently three monitoring wells at the site (MW-2, MW-5, and MW-6) that consistently contain dissolved benzene and/or MTBE above the State of California primary MCLs of 1.0 µg/L and 13 µg/L, respectively. Hydrocarbon concentrations in the other six monitoring wells (MW-1, MW-3, MW-4, MW-7, MW-8, and MW-9) have been near or below the MCLs for at least one year (or since the well was installed, in the case of MW-7, MW-8, and MW-9). Recent dissolved benzene and MTBE concentrations in site wells are summarized in Table 4 and Figure 9.

It has been observed that the attenuation of dissolved hydrocarbon concentrations at fuel hydrocarbon sites generally follows a first-order decay trend once the majority of hydrocarbon source material has been removed. The following equation has been used to describe the observed concentration decrease at a point (e.g. monitoring well) within a dissolved hydrocarbon plume:

$$C = C_0 e^{-kt}$$

Where: C = concentration at time t (µg/L)
 C₀ = peak concentration (µg/L)
 k = overall attenuation rate constant (days⁻¹)
 t = elapsed time after observation of peak concentration (days)

To estimate the time required for benzene and MTBE beneath the site to attenuate to MCLs through RNA, SECOR used concentration trends in key wells at the site to estimate first-order attenuation rate constants for benzene and MTBE. The resulting rate constants were then used to extrapolate the estimated time to reach MCLs at the site.

The highest remaining benzene concentrations have been reported in well MW-6, downgradient of the USTs. A data set beginning with the maximum observed concentration of 4,200 µg/L on January 9, 2003 through the most recent data point, 1,800 µg/L on January 20, 2005, was used for analysis. A semi-log plot of benzene concentration versus time for well MW-6 is presented as Figure 11. A least-squares statistical method was used to calculate the best-fit line through the data set. The best-fit line and equation are included on Figure 13. The slope of the best-fit line (0.0007 days⁻¹) is the estimated first-order attenuation rate constant for the data set. The first order decay equation and estimated rate constant are then used to estimate the time required for benzene concentrations to reach 1 µg/L. This method estimated that benzene concentrations in the vicinity of well MW-6 will reach 1 µg/L in approximately 30 years. A summary of the well MW-6 benzene concentration trend analysis for well MW-6 is provided in Table 13.

The highest MTBE concentrations have also been reported in well MW-6. For MTBE in well MW-6, a data set beginning with the maximum observed concentration of 61,000 µg/L on

September 11, 2002, through the most recent data point, 5,600 µg/L on January 20, 2005 was used for analysis. A semi-log plot of MTBE concentration versus time for well MW-6 and the resulting best-fit line and equation are presented as Figure 14. The equation for the best-fit line was then used to estimate the time required for MTBE concentrations to reach 13 µg/L. This method estimated that MTBE concentrations in the vicinity of well MW-6 will reach 13 µg/L in approximately 10 years. A summary of the trend analysis for well MW-6 is provided in Table 13.

A similar concentration trend analysis was performed for benzene in well MW-2 and MTBE in wells MW-2 and MW-5. For well MW-2 the trend analysis estimated that benzene concentrations in the vicinity of this well will reach MCLs in approximately seven years (Figure 15) and MTBE concentrations will reach MCLs in approximately three years (Figure 16). For well MW-5 the trend analysis estimated that MTBE concentrations in the vicinity of this well will reach MCLs in less than four years (Figure 17). A summary of the trend analyses is provided in Table 13.

Based on a review of the site data and experience at similar sites, it is estimated that groundwater concentrations below the site will reach MCLs in less than 40 years. This estimate allows for a reasonable amount of uncertainty due to the possible presence of small pockets of residual hydrocarbons below the site that could result in future short-term concentration spikes. This estimate does not account for the possibility of a future release at the site.

7.0 CORRECTIVE ACTION WORK PLAN

Based on the selection of Remedial Alternative 3 (RNA), no further active remediation would be required. A permit application for well destruction will be prepared following concurrence from SAM with this CAP and completion of the required 30-day public notification period.

8.0 VERIFICATION MONITORING AND REPORTING PLAN

Further monitoring and reporting are considered unnecessary at the site because RNA has been demonstrated by the existing monitoring program. It is SECOR's professional opinion that sufficient monitoring of the groundwater quality at the site has already occurred.

9.0 PUBLIC NOTIFICATION

A public notification program will be implemented as part of the Corrective Action Plan approval process. This program will include distribution of Public Notices to adjacent local businesses, residences and the local planning agency. The public notice will describe the proposed CAP and invite interested parties to review the CAP at a local library and/or the offices of the SAM. There will be a 30-day period for the public to review the CAP and to comment directly to the SAM.

10.0 REFERENCES

- Acros Organics N.V., 2002, Material Safety Data Sheet, tert-Amyl methyl ether, 94%, Revision #3, October 17.
- Banks Information Solutions, Inc., 2003, Water Well Report, ARCO Station 5350, 3804 Plaza Drive, Oceanside, California 92056, Report No. 090303-022, dated September 3.
- California Department of Fish and Game, 2005, IMAPS Viewer website, <http://imaps.dfg.ca.gov>
- California Department of Water Resources, 1967, Bulletin 106-2, Groundwater Occurrence and Quality: San Diego Region.
- California Division of Mines and Geology, 1982, Recent Slope Failures, Ancient Landslides, and Related Geology of the North-Central Coastal Area, San Diego County, California, Open-File Report 82-12.
- California Environmental Protection Agency (CalEPA), Office of Environmental Health Hazard Assessment, 1999, Public Health Goal for Methyl Tertiary Butyl Ether (MTBE) in Drinking Water, dated March.
- California Regional Water Quality Control Board (RWQCB), San Diego Region, 1994, Water Quality Control Plan, San Diego Basin (9).
- California State Water Resources Control Board, 2005, Geo Tracker website www.geotracker.swrcb.ca.gov
- County of San Diego, Department of Environmental Health, Site Assessment and Mitigation Program, 2004, Site Assessment and Mitigation (SAM) Manual.
- Lyondell, 2003, *Material Data Safety Sheet No. BE106, Methyl tertiary Butyl Ether*, Lyondell Chemical Company, 11 pp.
- New Jersey Department of Health and Senior Services (NJDHSS), (no date), Right to Know Hazardous Substance Fact Sheets; <http://www.state.nj.us/health/eoh/rtkweb/rtkhsfs.htm>
- Oceanside Water Utilities Department, 2005, personal communication with Mike McGrath, telephone number (760) 435-5800, March 24.
- SECOR International Incorporated, (SECOR), 2001, Product Line/Dispenser Replacement Report, ARCO Facility No. 5350, 3804 Plaza Drive, Oceanside, California, dated March 20.
- SECOR, 2002, Site Assessment Report, ARCO Facility No. 5350, 3804 Plaza Drive, Oceanside, California, dated February 6.

SECOR, 2003, Report of Additional Site Assessment, ARCO Facility No. 5350, 3804 Plaza Drive, Oceanside, California, dated January 8.

SECOR, 2004, Report of Additional Site Assessment, ARCO Facility No. 5350, 3804 Plaza Drive, Oceanside, California, dated November 22.

SECOR, 2005, ARCO Quarterly Groundwater Remediation Report for First Quarter 2005, dated March 9.

Spinnler, Gerard E., Salanitro, J.P., Maner, P.M., and Lyons, K.A., 2001, Enhanced Bioremediation of MTBE (Bioremedy) at Retail Gas Stations – Contaminated Soil Sediment & Water Special Oxygenated Fuels Edition, p. 47-49.

United States Environmental Protection Agency (EPA), 1995, How to Evaluate Alternative Cleanup Technologies for Underground Storage Tanks Sites: A Guide for Corrective Action Plan Reviewers (EPA 510-B-94-003 and EPA 510-B-95-007).

EPA, 1998a, San Diego County, Herbicide Interim Measures Bulletin website, <http://www.cdpr.ca.gov/docs/es/intmenu.htm>

EPA, 1998b, San Diego County, Rodenticide Interim Measures Bulletin website, <http://www.cdpr.ca.gov/docs/es/intmenu.htm>

EPA, 1999a, San Diego County, Insecticide Interim Measures Bulletin website, <http://www.cdpr.ca.gov/docs/es/intmenu.htm>

EPA, 1999b, San Diego County, Fungicide Interim Measures Bulletin website, <http://www.cdpr.ca.gov/docs/es/intmenu.htm>

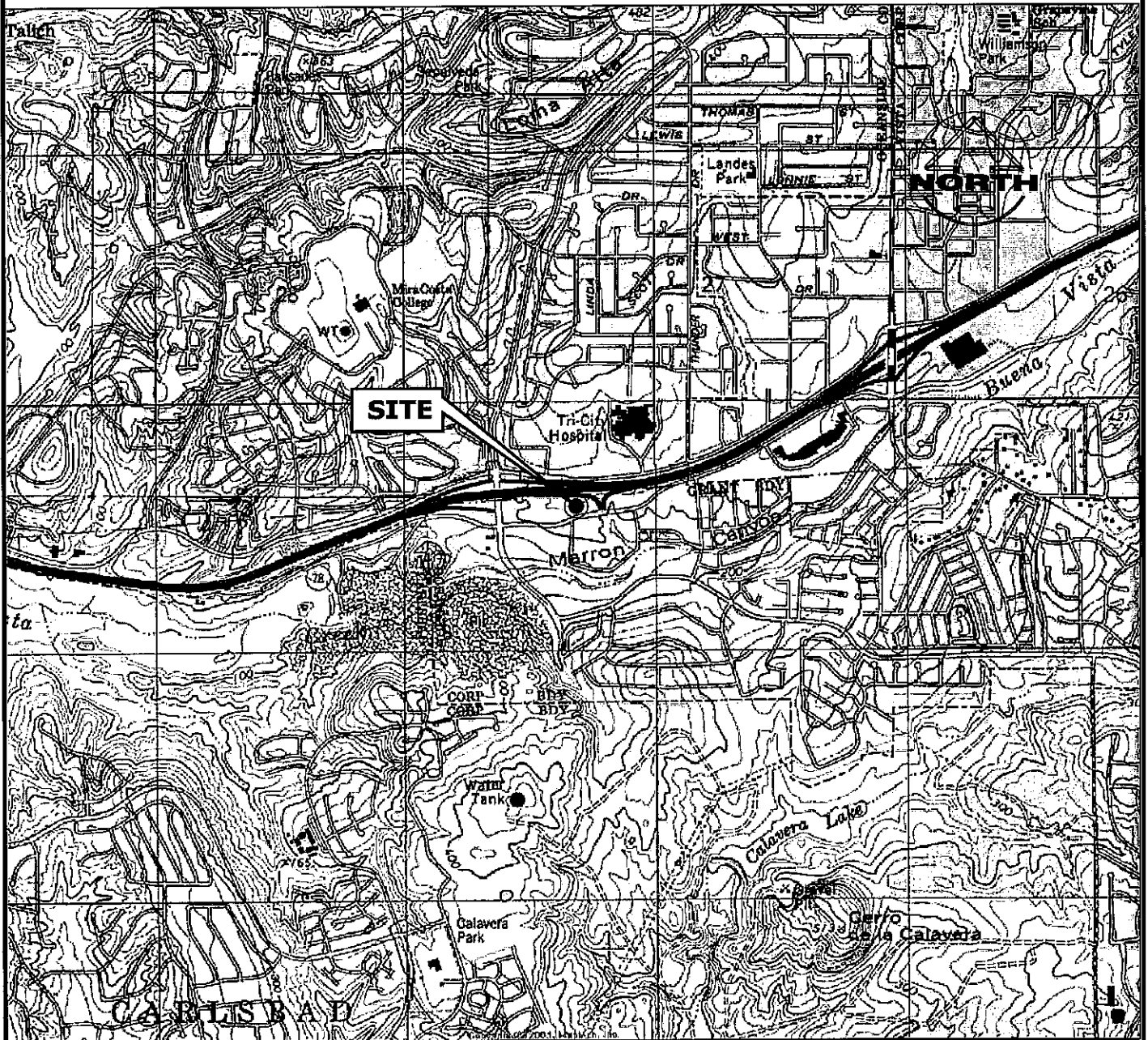
U.S. Geological Survey (USGS), 1967 (photorevised 1975), San Luis Rey, California Quadrangle, 7.5-Minute Topographic Map, Scale 1:24,000.

USGS, 2005, Water Well Data Website <http://www.waterdata.usgs.gov>

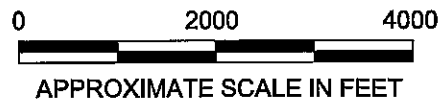
Wilson, John T., Cho, J.S., and Wilson, B.H., 2000, Natural Attenuation of MTBE in the Subsurface under Methanogenic Conditions. United States EPA, Office of Research and Development, National Risk Management Research Laboratory.

FIGURES
CORRECTIVE ACTION PLAN
ATLANTIC RICHFIELD COMPANY
ARCO Facility #5350
3804 Plaza Drive
Oceanside, California
Unauthorized Release #H20645-001
SECOR PROJECT NO. 08BP.05350.05
April 21, 2005

P:\CAD\ALL PROJECTS\2005\DWG6\ARCO 2005\5350-2\5350TOPO2.DWG MODIFIED BY LHUNTER ON APR 20, 2005 - 9:16



REFERENCE: U.S. GEOLOGICAL SURVEY, 1967 (PHOTOREVISED 1975). SAN LUIS REY, CALIFORNIA QUADRANGLE
7.5-MINUTE TOPOGRAPHIC MAP, SCALE 1: 24,000



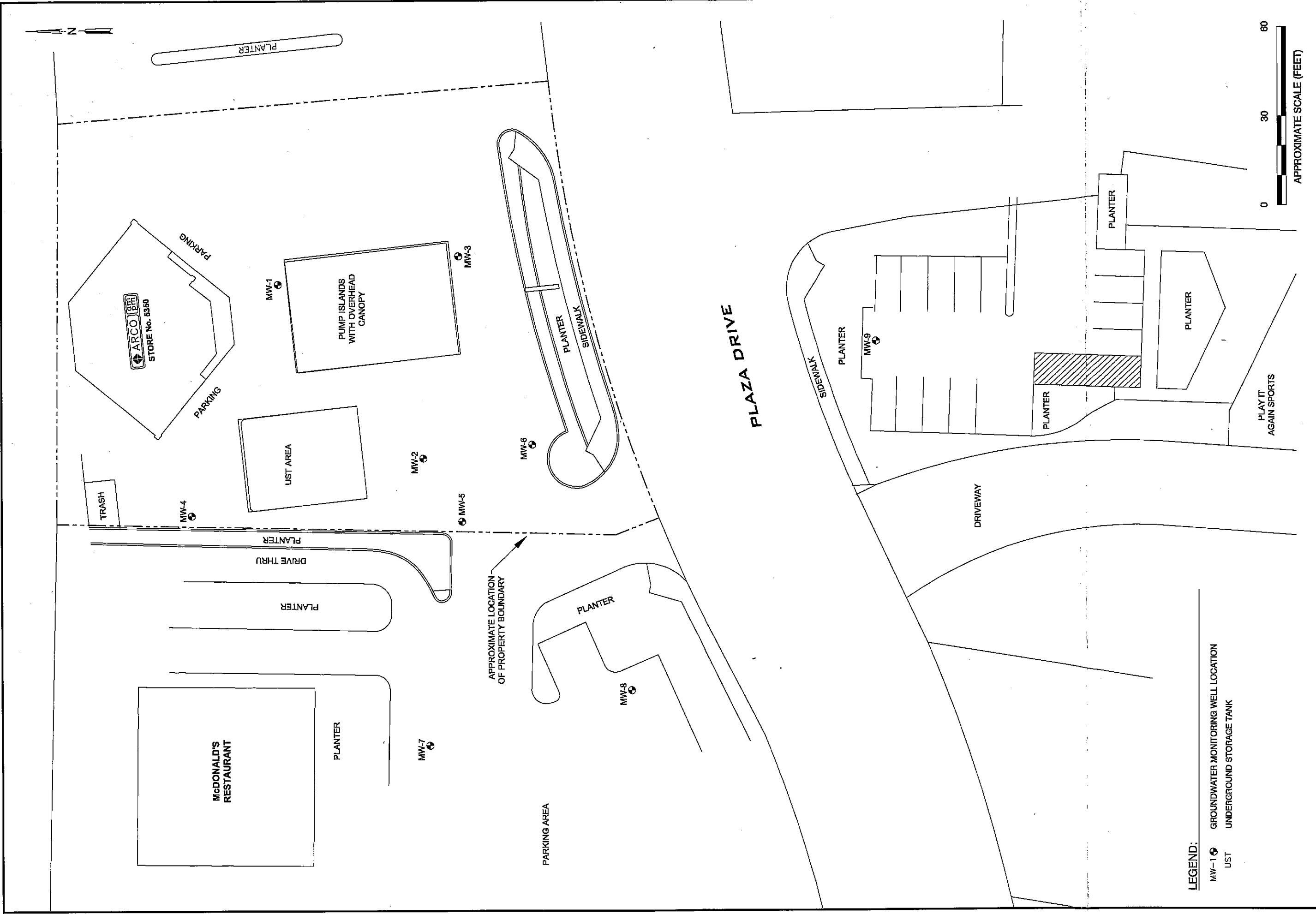
DRAWN BY: LGH
CHECKED: *Klem*
APPROVED: *Klem*
DATE: 4/19/05
JOB No.: 08BP.05350.05
CAD FILE: 5350TOPO2

PREPARED BY:

SECOR
2655 Camino del Rio North, Suite 302
San Diego, California

PREPARED FOR:
ARCO FACILITY #5350
3804 PLAZA DRIVE
OCEANSIDE, CALIFORNIA


FIGURE: 1
SITE LOCATION MAP



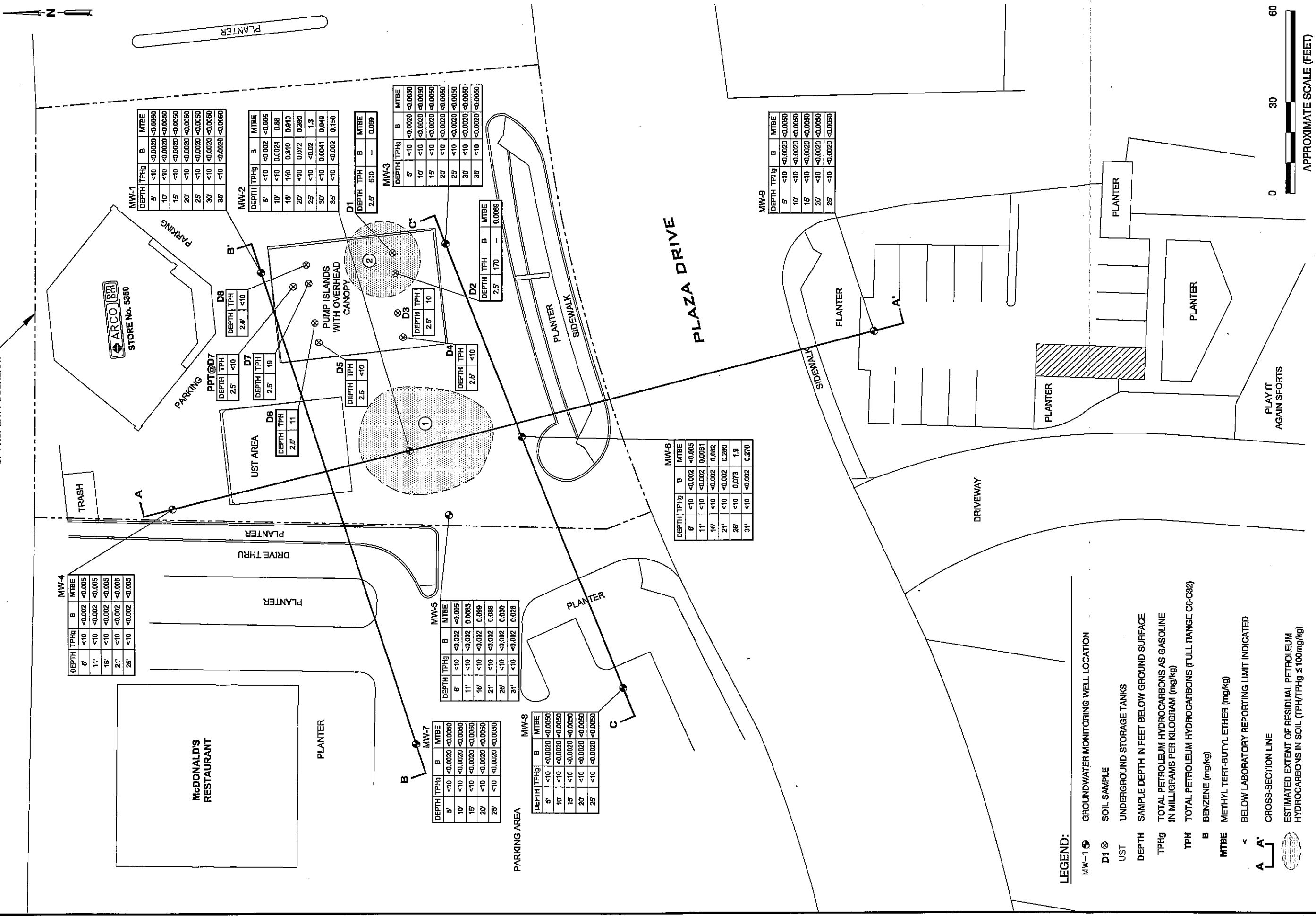
LEGEND:

MW-1 • GROUNDWATER MONITORING WELL LOCATION

UST UNDERGROUND STORAGE TANK

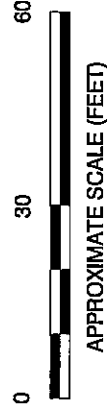
 <p>SECOR 2655 CAMINO DEL RIO NORTH, SUITE 302 SAN DIEGO, CALIFORNIA PHONE: (619) 296-6195/296-6198 (FAX)</p>	<p>FOR:</p> <p>ARCO FACILITY #5350 3804 Plaza Drive Oceanside, California</p>	<p>SITE PLAN</p>	<p>FIGURE: 2</p>
<p>JOB NUMBER: 08BP.05350.05</p>	<p>DRAWN BY: HJO</p>	<p>CHECKED BY: MW</p>	<p>APPROVED BY: KPM</p>
<p>DATE: 2/11/05</p>	<p>DATE: 2/11/05</p>	<p>DATE: 2/11/05</p>	<p>DATE: 2/11/05</p>

APPROXIMATE LOCATION
OF PROPERTY BOUNDARY



LEGEND:

- MW-1 GROUNDWATER MONITORING WELL LOCATION
- D1 SOIL SAMPLE
- UST UNDERGROUND STORAGE TANKS
- DEPTH SAMPLE DEPTH IN FEET BELOW GROUND SURFACE
- TPHg TOTAL PETROLEUM HYDROCARBONS AS GASOLINE IN MILLIGRAMS PER KILOGRAM (mg/kg)
- TPH TOTAL PETROLEUM HYDROCARBONS (FULL RANGE C6-C32)
- B BENZENE (mg/kg)
- MTBE METHYL TERT-BUTYL ETHER (mg/kg)
- < BELOW LABORATORY REPORTING LIMIT INDICATED
- CROSS-SECTION LINE
- ESTIMATED EXTENT OF RESIDUAL PETROLEUM HYDROCARBONS IN SOIL (TPH/TPHg ≤ 100mg/kg)

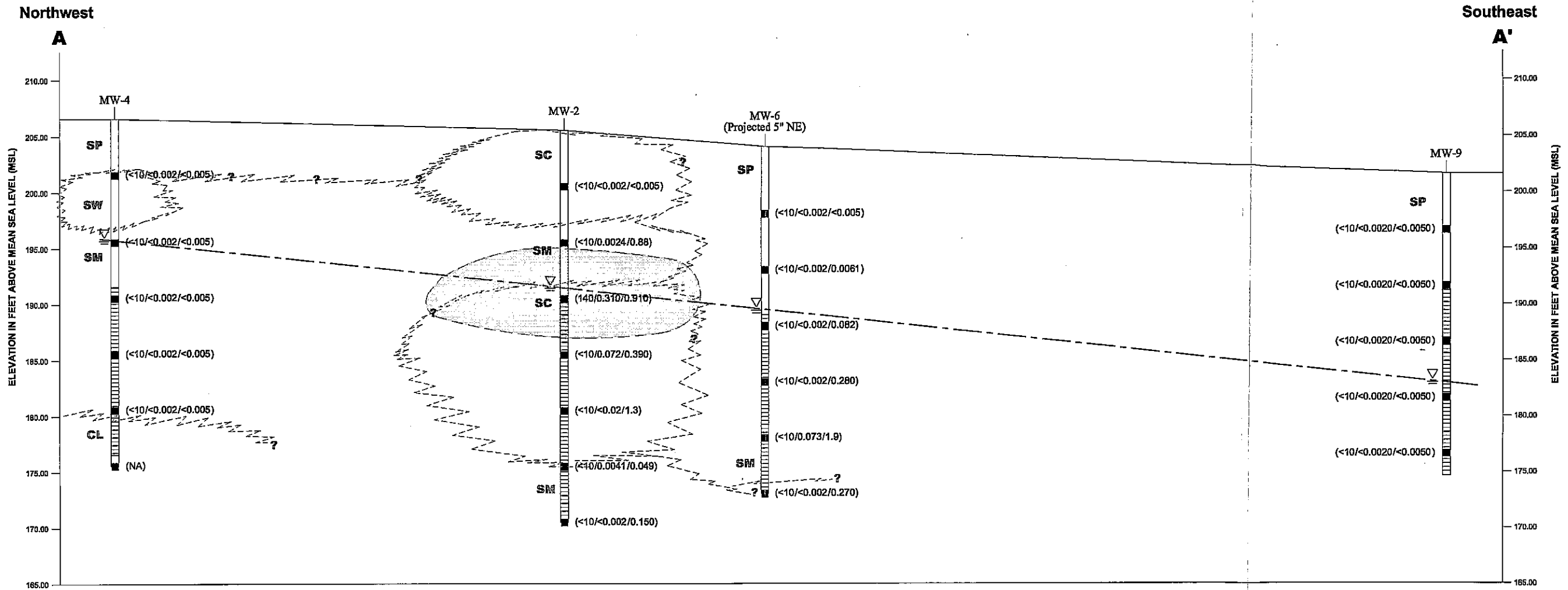


SECOR
2655 CAMINO DEL RIO NORTH, SUITE 302
SAN DIEGO, CALIFORNIA
PHONE: (619) 296-6195/296-6199 (FAX)

FOR:
ARCO FACILITY #5350
3804 Plaza Drive
Oceanside, California

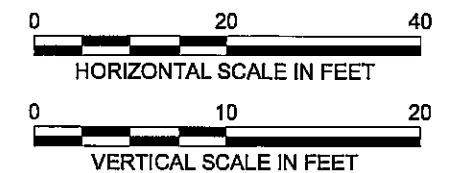
TPHg, BENZENE, AND MTBE
CONCENTRATIONS IN SOIL

FIGURE: **3**

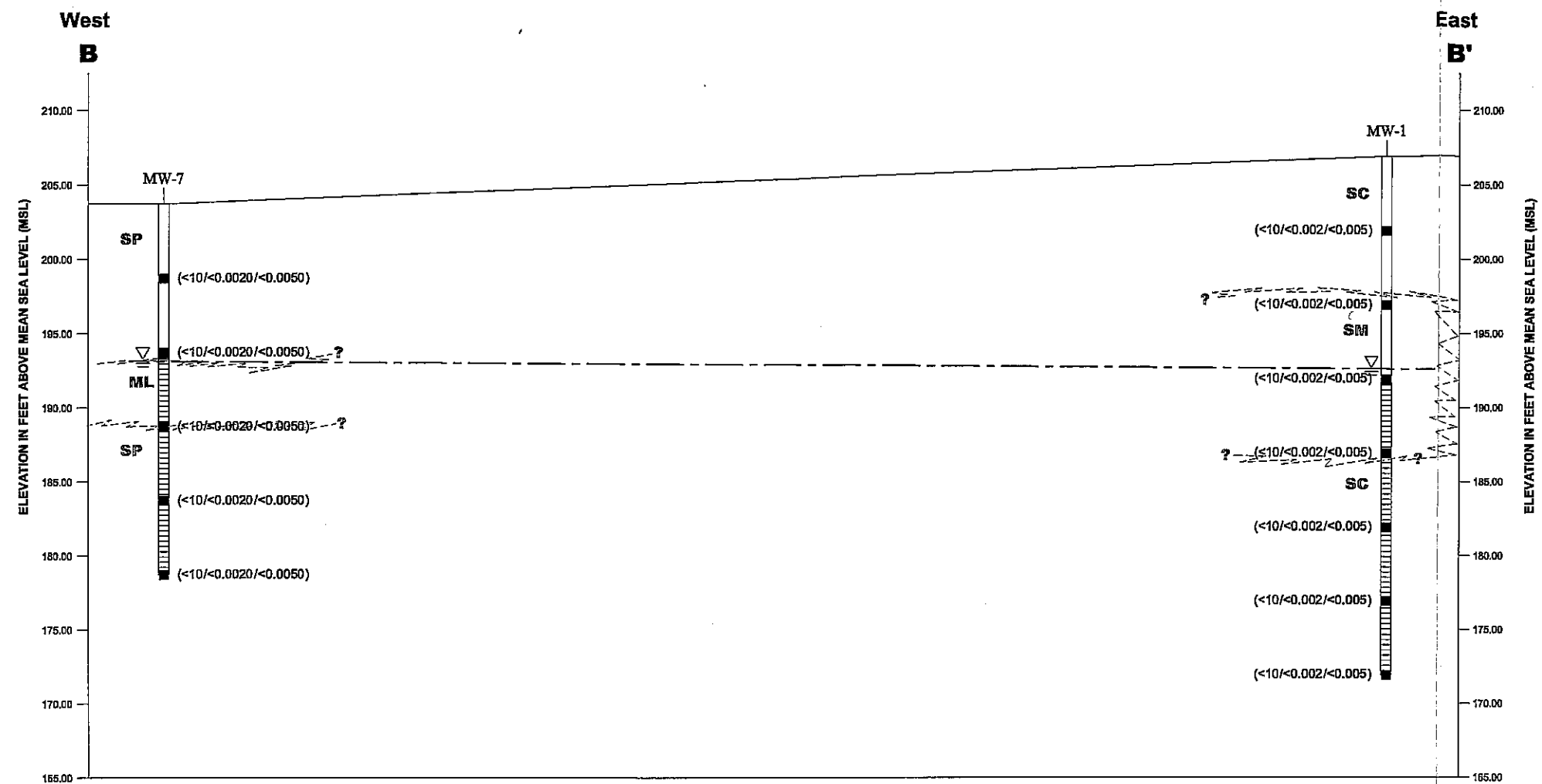


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




- BLANK PVC CASING INTERVAL
- SCREENED PVC WELL INTERVAL
- SOIL SAMPLE LOCATION WITH TOTAL PETROLEUM HYDROCARBONS AS GASOLINE (TPHg), BENZENE, AND METHYL TERT-BUTYL ETHER (MTBE) CONCENTRATIONS MEASURED IN MILLIGRAMS PER KILOGRAM (mg/kg).
- LESS THAN REPORTING LIMIT INDICATED
- [NA] NOT AVAILABLE
- INFERRED SOIL CONTACT
- APPROXIMATE DEPTH TO GROUNDWATER
- ESTIMATED EXTENT OF RESIDUAL PETROLEUM HYDROCARBONS IN SOIL (TPHg IN MILLIGRAMS PER KILOGRAM 100mg/kg)
- SP** POORLY GRADED SAND
- CL** SANDY CLAY
- SM** SILTY SAND
- SW** WELL GRADED SAND
- SC** CLAYEY SAND

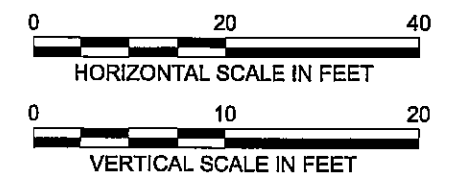



 SECOR 2655 CAMINO DEL RIO NORTH, SUITE 302 SAN DIEGO, CALIFORNIA PHONE: (619) 296-6195/296-6199 (FAX)	FOR:		ARCO FACILITY #5350 3804 Plaza Drive Oceanside, California		FIGURE:	
	JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:	
	08BP.05350.05	RJO	MW	KRM	9/22/04	



LEGEND:

-  -BLANK PVC CASING INTERVAL
-  -SCREENED PVC WELL INTERVAL
-  (<10/<0.002/<0.005) SOIL SAMPLE LOCATION WITH TOTAL PETROLEUM HYDROCARBONS AS GASOLINE (TPHg), BENZENE, AND METHYL TERT-BUTYL ETHER (MTBE) CONCENTRATIONS MEASURED IN MILLIGRAMS PER KILOGRAM (mg/kg).
-  < LESS THAN REPORTING LIMIT INDICATED
-  ? - - - - - INFERRED SOIL CONTACT
-  - - - - - APPROXIMATE DEPTH TO GROUNDWATER
- SP** POORLY GRADED SAND
- SM** SILTY SAND
- SC** CLAYEY SAND
- ML** SANDY SILT




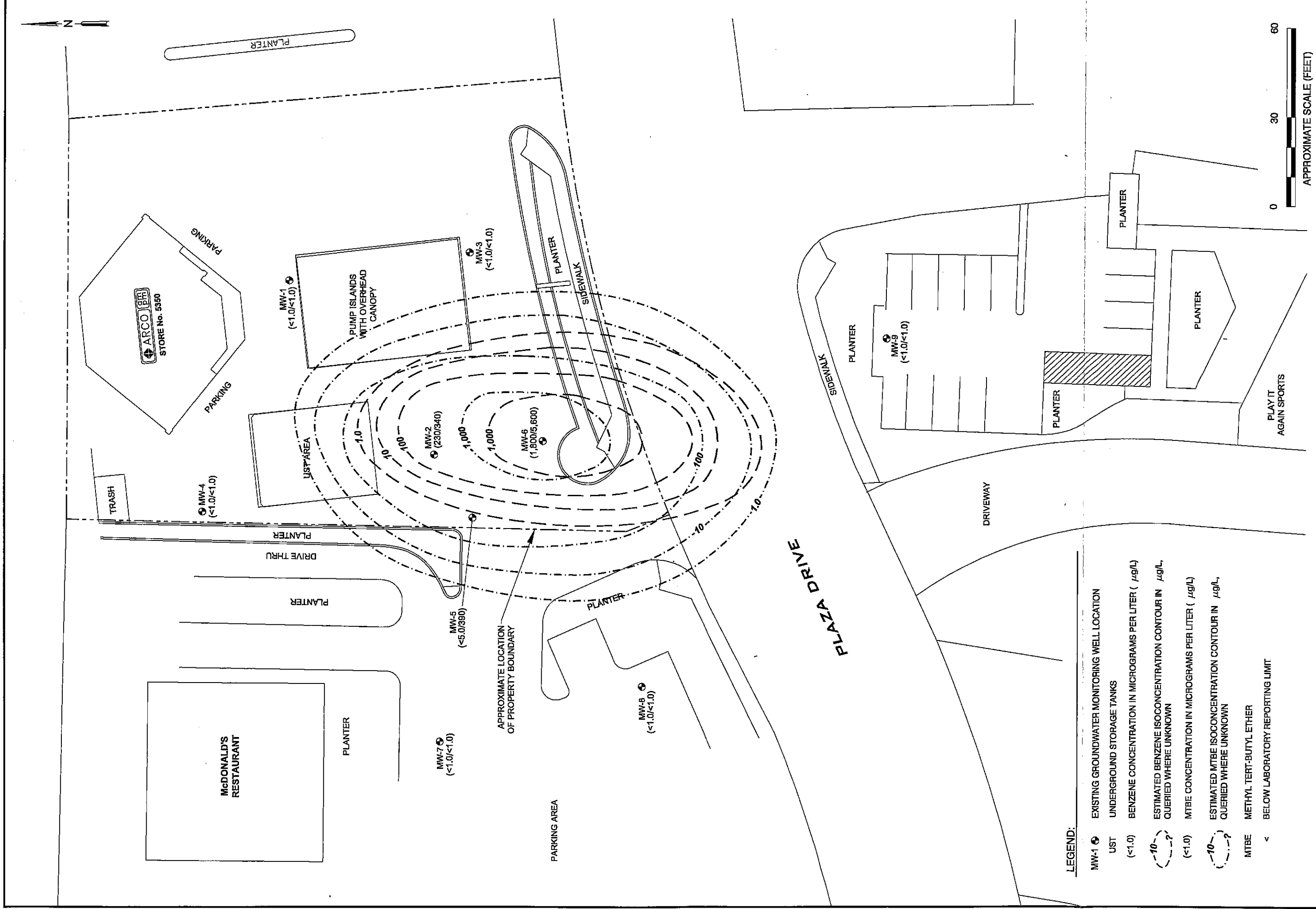
 SECOR 2655 CAMINO DEL RIO NORTH, SUITE 302 SAN DIEGO, CALIFORNIA PHONE: (619) 296-6195/296-6199 (FAX)	FOR: ARCO FACILITY #5350 3804 Plaza Drive Oceanside, California		GEOLOGIC CROSS SECTION B-B'		FIGURE: 5
	JOB NUMBER: 08BP.05350.05	DRAWN BY: RJO	CHECKED BY: MW	APPROVED BY: KRM	DATE: 9/22/04




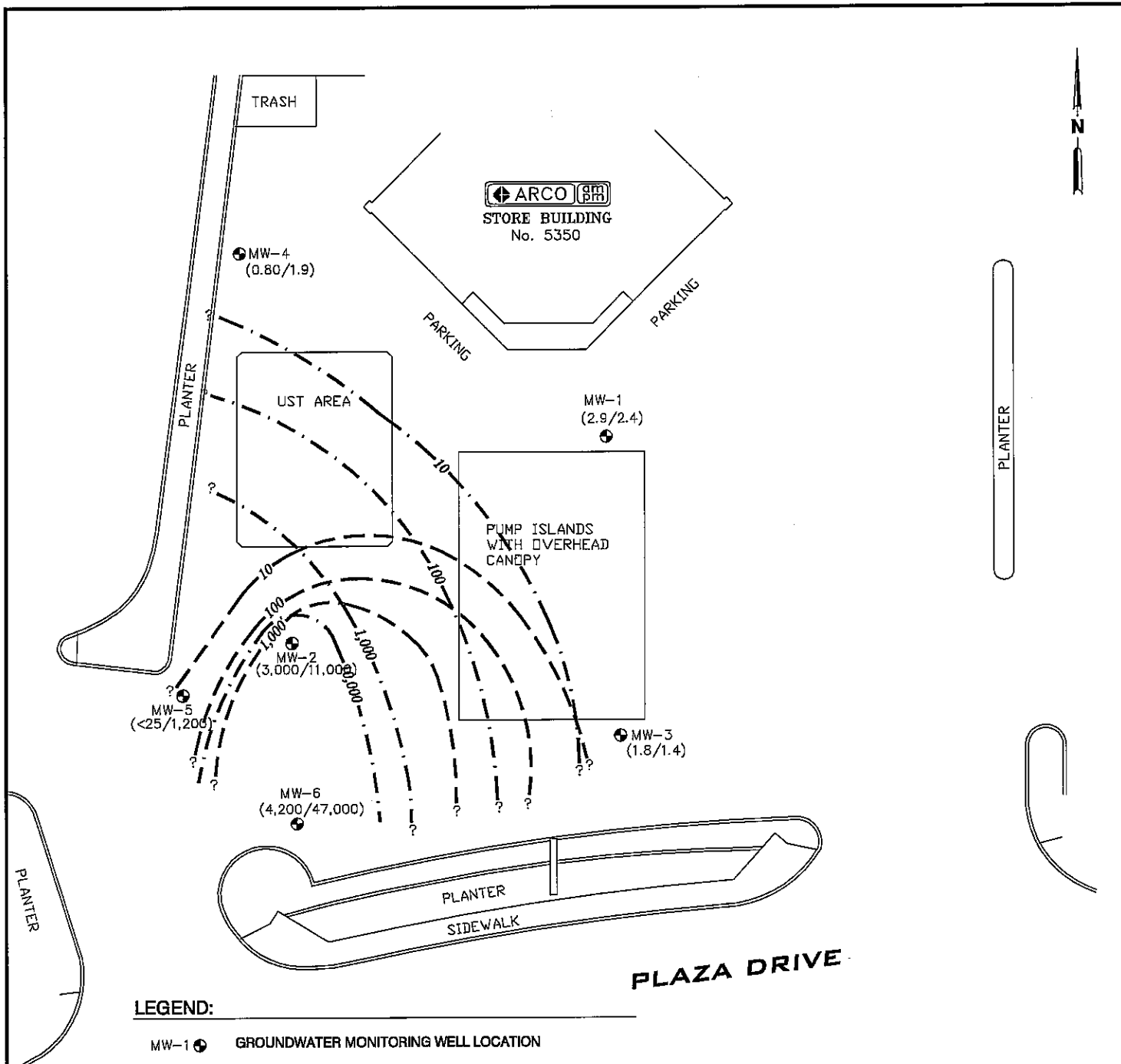
0 20 40
HORIZONTAL SCALE IN FEET


0 10 20
VERTICAL SCALE IN FEET

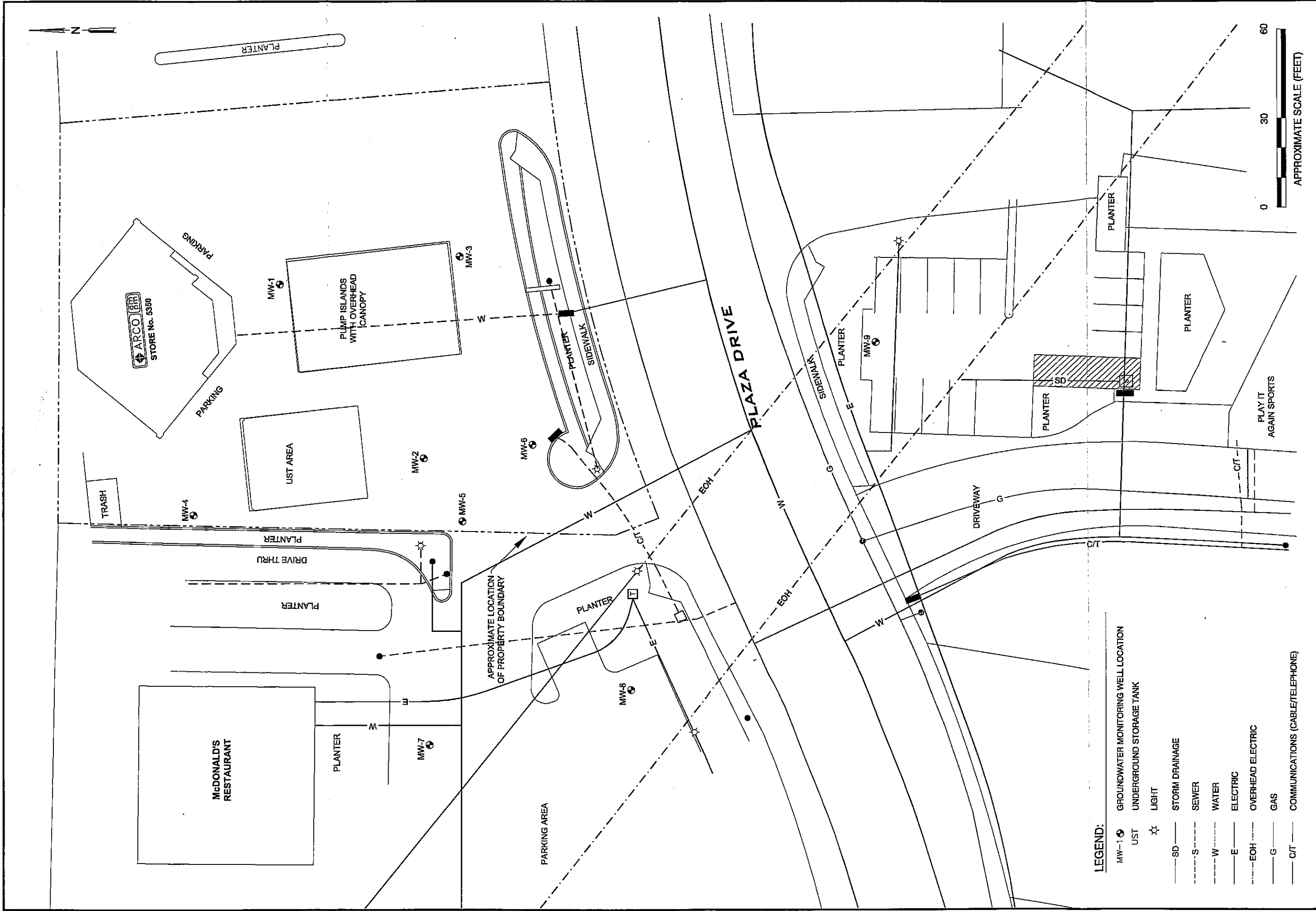
 2655 CAMINO DEL RIO NORTH, SUITE 302 SAN DIEGO, CALIFORNIA PHONE: (619) 296-6195/296-6199 (FAX)	FOR: ARCO FACILITY #5350 3804 Plaza Drive Oceanside, California		GEOLOGIC CROSS SECTION C-C'		FIGURE: 6
	JOB NUMBER: 08BP.05350.05	DRAWN BY: RJO	CHECKED BY: MW	APPROVED BY: KRM	DATE: 9/22/04



 SECOR 2655 CAMINO DEL RIO NORTH, SUITE 302 SAN DIEGO, CALIFORNIA PHONE: (619) 296-6195/296-6199 (FAX) FILLER & THORNTON, INC. 1800 HILLSIDE DRIVE, SUITE 200, SAN ANTONIO, TEXAS 78214	FOR: ARCO FACILITY #5350 3804 Plaza Drive Oceanside, California		BENZENE AND MTBE ISOCONCENTRATION MAP JANUARY 20, 2005		FIGURE: 9
	JOB NUMBER: 08BP-UES50.05	DRAWN BY: RJO	CHECKED BY: MW	APPROVED BY: KRM	DATE: 2/22/05



 <p>SECOR 2655 CAMINO DEL RIO NORTH, SUITE 302 SAN DIEGO, CALIFORNIA PHONE: (619) 296-6195/296-6199 (FAX)</p>	<p>FOR:</p> <p>ARCO FACILITY #5350 3804 Plaza Drive Oceanside, California</p> <p>JOB NUMBER: 08BP.05350.03</p>	<p>BENZENE AND MTBE ISOCONCENTRATION MAP JANUARY 9, 2003</p> <p>CHECKED BY: MW</p> <p>APPROVED BY: KRM</p>	<p>FIGURE:</p> <p>11</p> <p>DATE: 2/11/03</p>
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 SECOR 2655 CAMINO DEL RIO NORTH, SUITE 302 SAN DIEGO, CALIFORNIA PHONE: (619) 296-6195/296-6189 (FAX) FILEPATH: P:\CAD\ALLPROJECTS\2005\DWGS\ARCO 2005\15350-245\15350UTM2-05.DWG\15350UTM2-05.DWG	FOR: ARCO FACILITY #5350 3804 Plaza Drive Oceanside, California	SITE VICINITY WITH LOCATIONS OF SUBSURFACE AND OVERHEAD UTILITIES	FIGURE: 12
JOB NUMBER: 08BP.05350.05	DRAWN BY: RJO	CHECKED BY: MW	APPROVED BY: KRM
			DATE: 2/19/05

Figure 13
Benzene Concentration Trend Evaluation - Well MW-6
ARCO Facility #5350

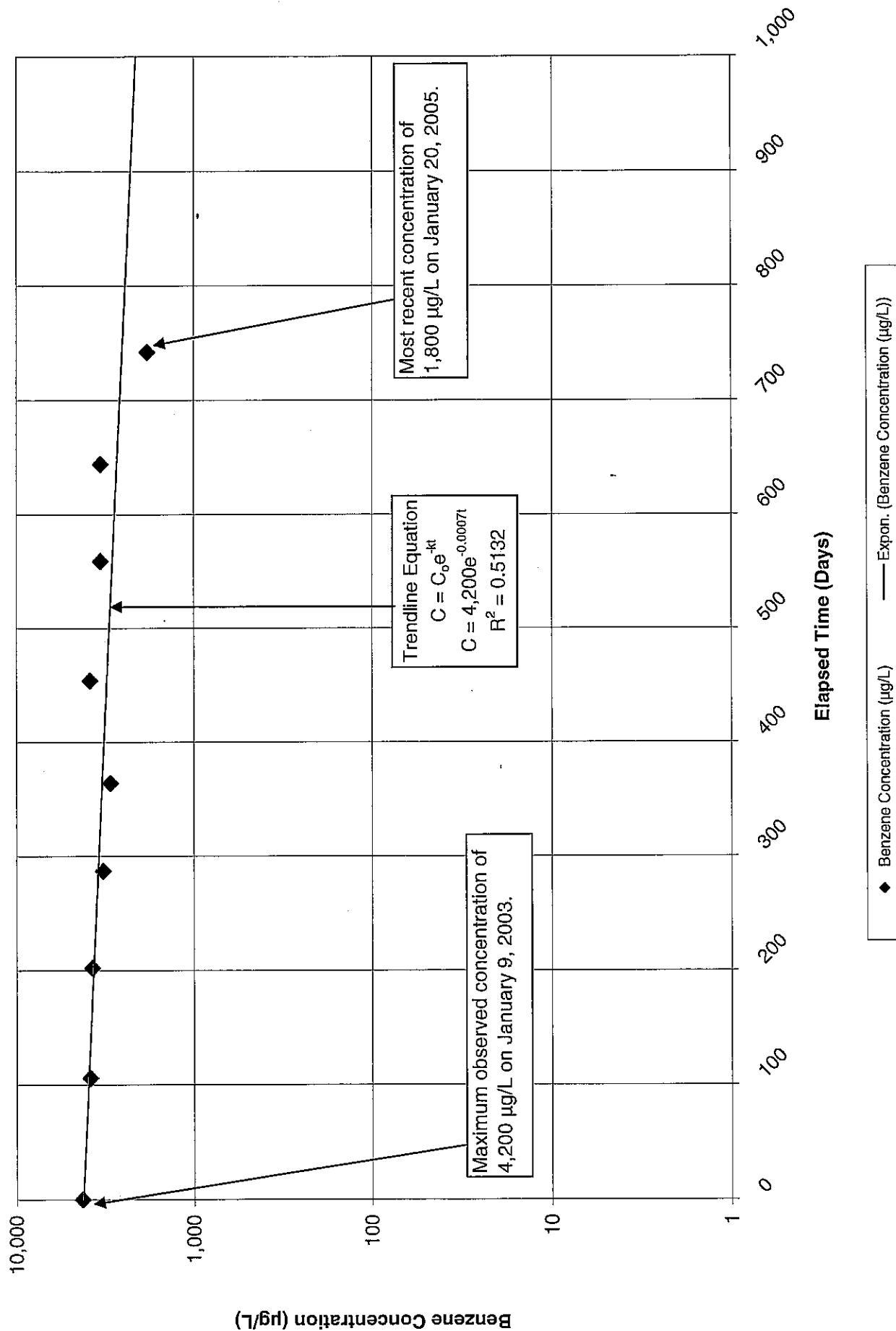


Figure 14
MTBE Concentration Trend Evaluation - Well MW-6
ARCO Facility #5350

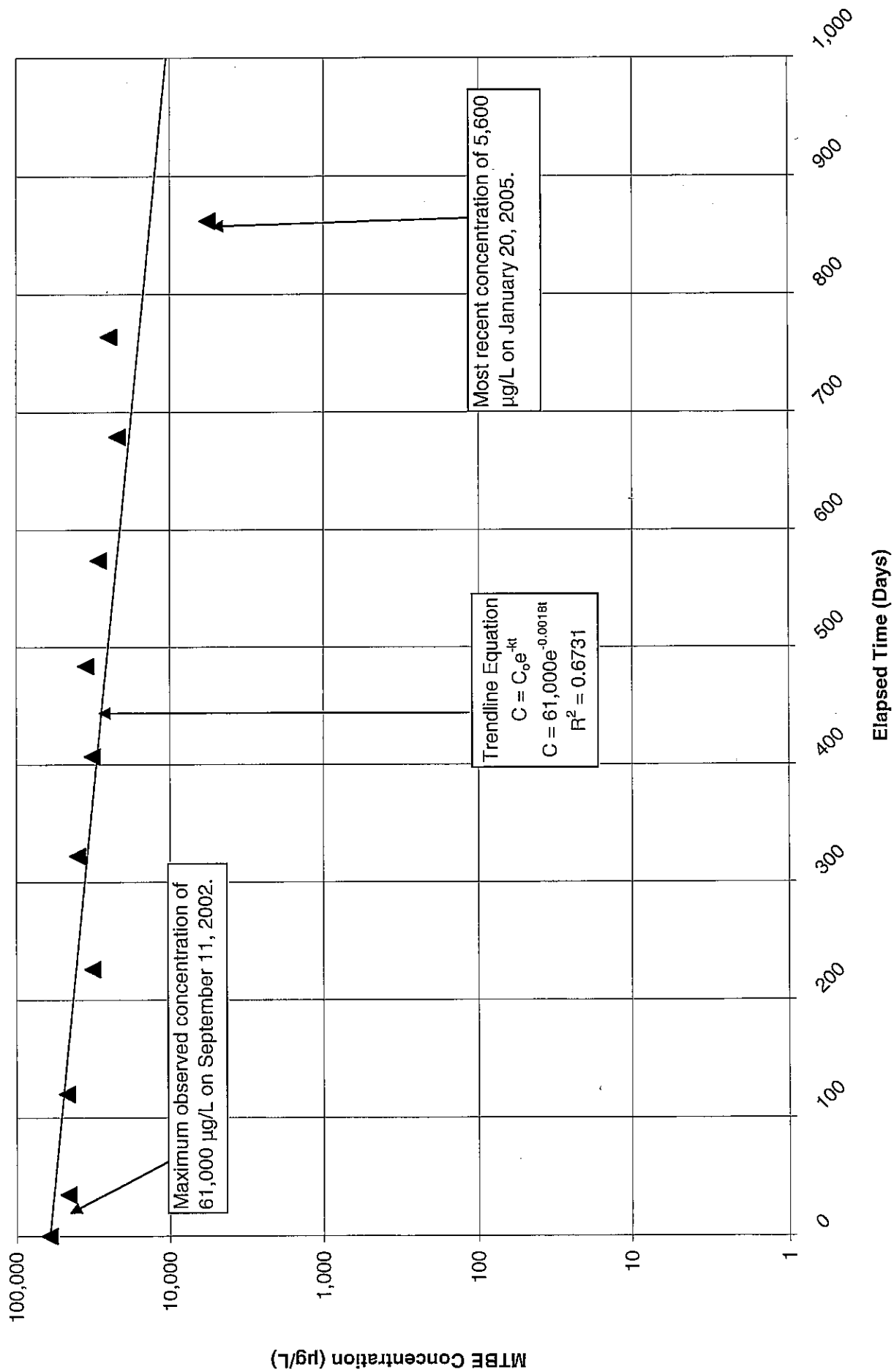


Figure 15
Benzene Concentration Trend Evaluation - Well MW-2
ARCO Facility #5350

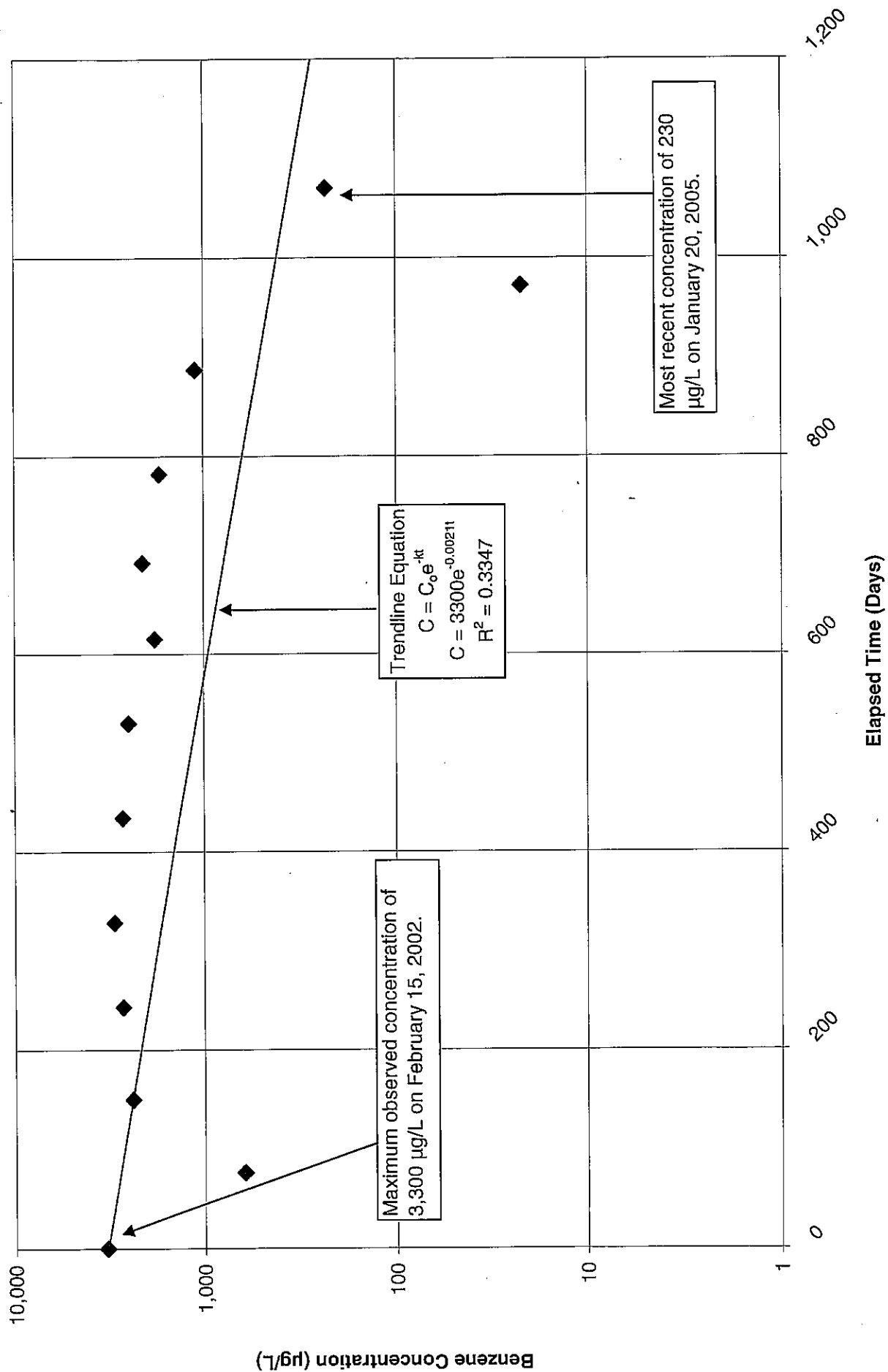


Figure 16
MTBE Concentration Trend Evaluation - Well MW-2
ARCO Facility #5350

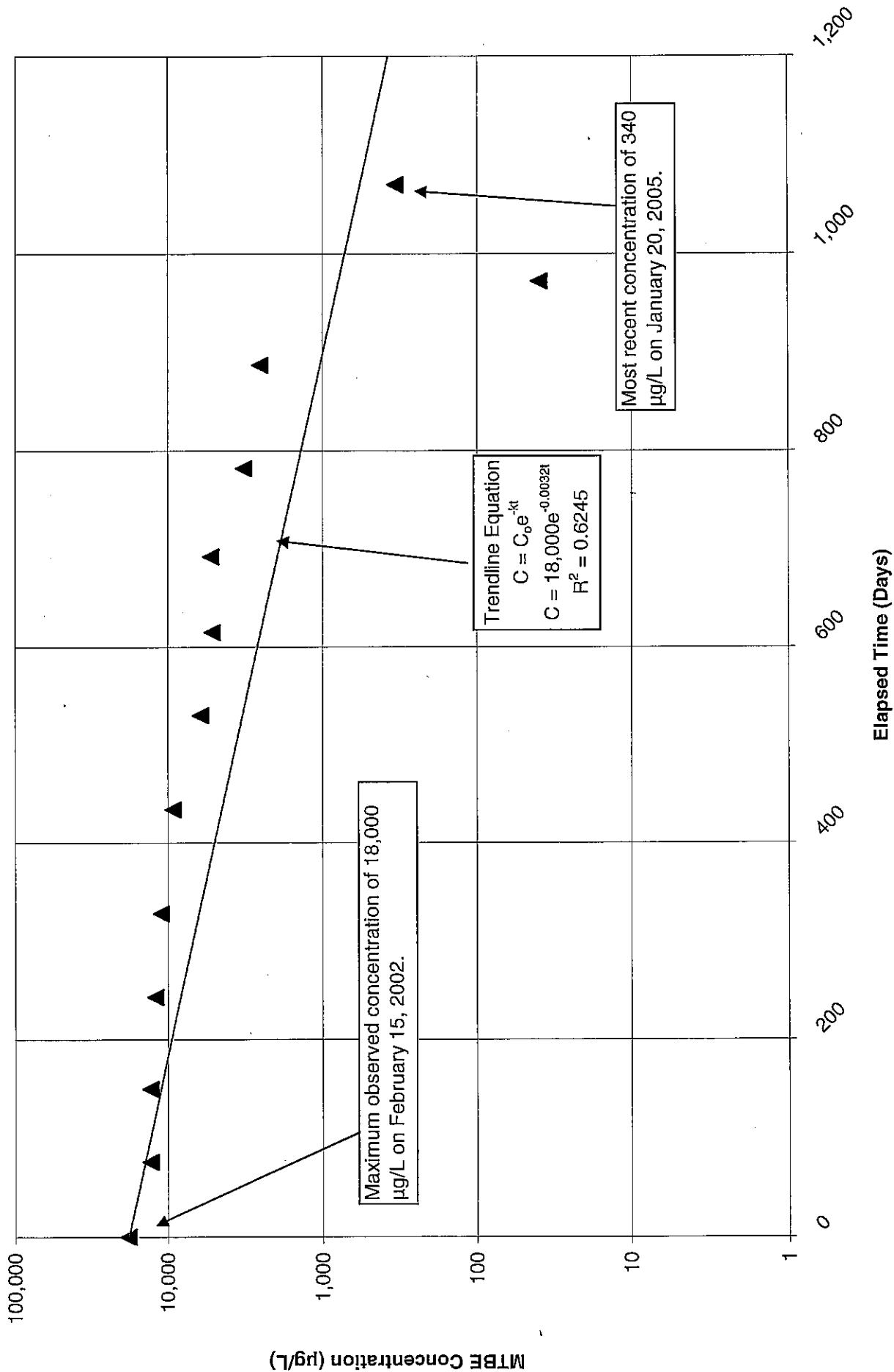
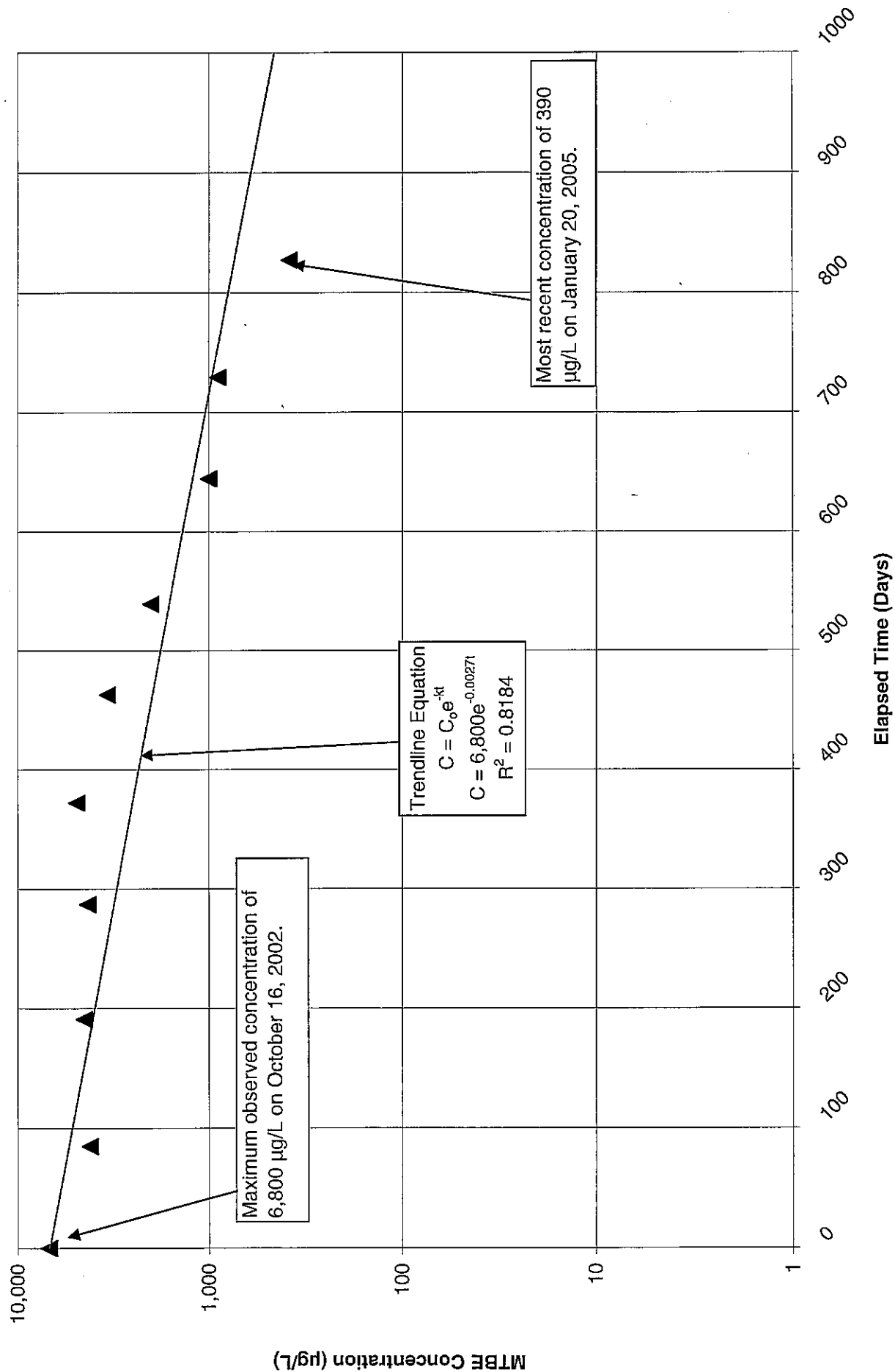


Figure 17
MTBE Concentration Trend Evaluation - Well MW-5
ARCO Facility #5350



TABLES
CORRECTIVE ACTION PLAN
ATLANTIC RICHFIELD COMPANY
ARCO Facility #5350
3804 Plaza Drive
Oceanside, California
Unauthorized Release #H20645-001
SECOR PROJECT NO. 08BP.05350.05
April 21, 2005

TABLE 1

SUMMARY OF BENEFICIAL GROUNDWATER AND SURFACE WATER USES
ARCO Facility #5350

San Diego Hydrologic Basin (9.00)*
 Carlsbad Hydrologic Unit (904.00)
 Buena Creek Hydrologic Area (904.20)
 El Salto Hydrologic Subarea (904.21)

Beneficial Use	Groundwater	Surface Water
Municipal/Domestic Supply	x	+
Agricultural Supply	x	x
Industrial Process Supply	O	x
Industrial Service Supply	O	x
Groundwater Recharge		
Freshwater Replenishment		
Hydropower Generation		
Contact Water Recreation (REC 1)		x
Non-contact Water Recreation (REC 2)		x
Warm Freshwater Habitat		x
Cold Freshwater Habitat		
Wildlife Habitat		x
Rare, Threatened, or Endangeres Species		x
Spawning, Reproduction, and/or Early Development		
Biological Habitats of Special Significance		x

Notes: *From California State Water Resources Board and Regional Water Quality Control Board, San Diego Region, "Water Quality Control Plan, San Diego Basin (9), 1994".

x = Present beneficial use.
 + = Excepted from municipal use.
 O = Potential beneficial use.

TABLE 2

SUMMARY OF GROUNDWATER ELEVATIONS, 2001 TO PRESENT
ARCO Facility #5350

Well Identification / Surveyed Well Elevation ¹	Date Measured	Depth to Water (Feet)	LPH Thickness (Feet)	Groundwater Elevation ²
MW-1 206.92 206.93	08/09/01	12.90	0.00	194.02
	12/20/01	13.18	0.00	193.74
	02/15/02	13.68	0.00	193.24
	05/02/02	14.62	0.00	192.30
	07/15/02	14.24	0.00	192.68
	10/16/02	13.39	0.00	193.54
	01/09/03	13.31	0.00	193.62
	04/25/03	12.50	0.00	194.43
	07/30/03	12.60	0.00	194.33
	10/23/03	12.72	0.00	194.21
	01/08/04	13.05	0.00	193.88
	04/07/04	13.09	0.00	193.84
	07/21/04	12.65	0.00	194.28
	10/14/04	12.60	0.00	194.33
	01/20/05	11.01	0.00	195.92
MW-2 205.48 205.49	08/09/01	13.99	sheen	191.49
	12/20/01	14.29	0.00	191.19
	02/15/02	14.25	0.00	191.23
	05/02/02	15.12	0.00	190.36
	07/15/02	15.02	0.00	190.46
	10/16/02	14.21	0.00	191.28
	01/09/03	14.35	0.00	191.14
	04/25/03	14.25	0.00	191.24
	07/30/03	13.53	0.00	191.96
	10/23/03	14.23	0.00	191.26
	01/08/04	13.94	0.00	191.55
	04/07/04	13.98	0.00	191.51
	07/21/04	13.06	0.00	192.43
	10/14/04	12.87	0.00	192.62
	01/20/05	11.32	0.00	194.17
MW-3 205.68 205.70	08/09/01	15.05	0.00	190.63
	12/20/01	15.11	0.00	190.57
	02/15/02	15.97	0.00	189.71
	05/02/02	16.24	0.00	189.44
	07/15/02	15.77	0.00	189.91
	10/16/02	14.62	0.00	191.08
	01/09/03	14.99	0.00	190.71
	04/25/03	14.80	0.00	190.90
	07/30/03	14.65	0.00	191.05
	10/23/03	14.53	0.00	191.17
	01/08/04	14.88	0.00	190.82
	04/07/04	15.35	0.00	190.35
	07/21/04	14.32	0.00	191.38
	10/14/04	14.63	0.00	191.07
	01/20/05	13.59	0.00	192.11
MW-4 206.60	09/09/02	11.29	0.00	195.31
	10/16/02	11.05	0.00	195.55
	01/09/03	10.09	0.00	196.51
	04/25/03	10.20	0.00	196.40
	07/30/03	10.67	0.00	195.93
	10/23/03	10.65	0.00	195.95
	01/08/04	11.09	0.00	195.51

TABLE 2

SUMMARY OF GROUNDWATER ELEVATIONS, 2001 TO PRESENT
ARCO Facility #5350

Well Identification / Surveyed Well Elevation ¹	Date Measured	Depth to Water (Feet)	LPH Thickness (Feet)	Groundwater Elevation ²
MW-4 cont'd	01/22/04	10.50	0.00	196.10
	04/07/04	10.79	0.00	195.81
	07/21/04	10.23	0.00	196.37
	10/14/04	9.18	0.00	197.42
	01/20/05	7.35	0.00	199.25
MW-5 204.75	09/09/02	14.43	0.00	190.32
	10/16/02	14.10	0.00	190.65
	01/09/03	13.85	0.00	190.90
	04/25/03	13.60	0.00	191.15
	07/30/03	13.42	0.00	191.33
	10/23/03	13.40	0.00	191.35
	01/08/04	13.89	0.00	190.86
	01/22/04	13.40	0.00	191.35
	04/07/04	13.62	0.00	191.13
	07/21/04	12.75	0.00	192.00
	10/14/04	11.96	0.00	192.79
	01/20/05	12.31	0.00	192.44
MW-6 204.05	09/11/02	14.80	0.00	189.25
	10/16/02	14.62	0.00	189.43
	01/09/03	14.45	0.00	189.60
	04/25/03	14.60	0.00	189.45
	07/30/03	13.95	0.00	190.10
	10/23/03	14.07	0.00	189.98
	01/08/04	14.31	0.00	189.74
	04/07/04	14.30	0.00	189.75
	07/21/04	13.33	0.00	190.72
	10/14/04	13.06	0.00	190.99
	01/20/05	12.10	0.00	191.95
MW-7 203.72	07/21/04	11.27	0.00	192.45
	10/14/04	10.28	0.00	193.44
	01/20/05	9.84	0.00	193.88
MW-8 202.23	07/21/04	13.39	0.00	188.84
	07/23/04	13.36	0.00	188.87
	10/14/04	12.67	0.00	189.56
	01/20/05	11.62	0.00	190.61
MW-9 201.61	07/21/04	16.85	0.00	184.76
	10/14/04	16.82	0.00	184.79
	01/20/05	15.62	0.00	185.99

Notes:

¹ = Elevations are in feet above mean sea level (MSL)² = Groundwater elevation in feet above MSL = Surveyed well elevation - Depth to water

LPH = Liquid-phase hydrocarbons

TABLE 3

SUMMARY OF SOIL SAMPLE ANALYTICAL RESULTS
ARCO Facility #5350
3804 Plaza Drive, Oceanside, CA

Concentrations are reported in milligrams per kilogram (mg/kg)

Sample Identification	Date Sampled	Depth (feet bgs)	TPHg	TPHd	TPH-Full	B	T	E	X	MTBE	DIPE	ETBE	TAME	TBA
Soil Samples Collected During Product Line and Dispenser Removal Activities														
D1/2.5'	12/05/00	2.5	<10	500	500	--	--	--	--	0.069	<0.031	<0.031	<0.031	3.0
D2/2.5'	12/05/00	2.5	15	150	170	--	--	--	--	0.0069	<0.005	<0.005	<0.005	18
D3/2.5'	12/05/00	2.5	<10	10	10	--	--	--	--	--	--	--	--	--
D4/2.5'	12/05/00	2.5	<10	<10	<10	--	--	--	--	--	--	--	--	--
D5/2.5'	12/05/00	2.5	<10	<10	<10	--	--	--	--	--	--	--	--	--
D6/2.5'	12/05/00	2.5	<10	11	11	--	--	--	--	--	--	--	--	--
D7/2.5'	12/05/00	2.5	<10	19	19	--	--	--	--	--	--	--	--	--
D8/2.5'	12/05/00	2.5	<10	<10	<10	--	--	--	--	--	--	--	--	--
PPT@D7/2.5'	12/05/00	2.5	<10	<10	<10	--	--	--	--	--	--	--	--	--
Soil Samples Collected During Site Assessment Activities														
MW-1/5'	07/23/01	5	<10	--	--	<0.002	<0.002	<0.002	<0.004	<0.005	<0.005	<0.005	<0.005	<0.50
MW-1/10'	07/23/01	10	<10	--	--	<0.002	<0.002	<0.002	<0.004	<0.005	<0.005	<0.005	<0.005	<0.50
MW-1/15'	07/23/01	15	<10	--	--	<0.002	<0.002	<0.002	0.0064	<0.005	<0.005	<0.005	<0.005	<0.50
MW-1/20'	07/23/01	20	<10	--	--	<0.002	<0.002	<0.002	0.0054	<0.005	<0.005	<0.005	<0.005	<0.50
MW-1/25'	07/23/01	25	<10	--	--	<0.002	<0.002	<0.002	0.0049	<0.005	<0.005	<0.005	<0.005	<0.50
MW-1/30'	07/23/01	30	<10	--	--	<0.002	<0.002	<0.002	<0.004	<0.005	<0.005	<0.005	<0.005	<0.50
MW-1/35'	07/23/01	35	<10	--	--	<0.002	<0.002	<0.002	0.0041	<0.005	<0.005	<0.005	<0.005	<0.50
MW-2/5'	07/23/01	5	<10	--	--	<0.002	<0.002	<0.002	0.0027	<0.005	<0.005	<0.005	<0.005	<0.50
MW-2/10'	07/23/01	10	<10	--	--	0.0024	0.044	0.021	0.177	0.88	<0.005	<0.005	0.0058	0.500
MW-2/15'	07/23/01	15	140	--	--	0.310	1.9	3.9	8.9	0.910	<0.05	<0.05	<0.05	<0.500
MW-2/20'	07/23/01	20	<10	--	--	0.072	0.081	0.041	0.218	0.390	<0.005	<0.005	<0.005	0.093
MW-2/25'	07/23/01	25	<10	--	--	<0.02	<0.02	<0.02	<0.04	1.3	<0.05	<0.05	<0.05	<0.5
MW-2/30'	07/23/01	30	<10	--	--	0.0041	0.0039	<0.002	0.012	0.049	<0.005	<0.005	<0.005	0.270
MW-2/35'	07/23/01	35	<10	--	--	<0.002	0.0023	<0.002	0.0082	0.150	<0.005	<0.005	<0.005	0.071
MW-3/5'	07/23/01	5	<10	--	--	<0.002	<0.002	<0.002	<0.004	<0.005	<0.005	<0.005	<0.005	<0.050
MW-3/10'	07/23/01	10	<10	--	--	<0.002	<0.002	<0.002	<0.004	<0.005	<0.005	<0.005	<0.005	<0.050
MW-3/15'	07/23/01	15	<10	--	--	<0.002	<0.002	<0.002	<0.004	<0.005	<0.005	<0.005	<0.005	<0.050
MW-3/20'	07/23/01	20	<10	--	--	<0.002	<0.002	<0.002	<0.004	<0.005	<0.005	<0.005	<0.005	<0.050
MW-3/25'	07/23/01	25	<10	--	--	<0.002	<0.002	<0.002	<0.004	<0.005	<0.005	<0.005	<0.005	<0.050
MW-3/30'	07/23/01	30	<10	--	--	<0.002	<0.002	<0.002	<0.004	<0.005	<0.005	<0.005	<0.005	<0.050
MW-3/35'	07/23/01	35	<10	--	--	<0.002	<0.002	<0.002	<0.004	<0.005	<0.005	<0.005	<0.005	<0.050
MW-4/5'	08/28/02	5	<10	--	--	<0.002	<0.002	<0.002	<0.004	<0.005	<0.005	<0.005	<0.005	<0.050
MW-4/11'	08/28/02	11	<10	--	--	<0.002	<0.002	<0.002	<0.004	<0.005	<0.005	<0.005	<0.005	<0.050
MW-4/16'	08/28/02	16	<10	--	--	<0.002	<0.002	<0.002	<0.004	<0.005	<0.005	<0.005	<0.005	<0.050
MW-4/21'	08/28/02	21	<10	--	--	<0.002	<0.002	<0.002	<0.004	<0.005	<0.005	<0.005	<0.005	<0.050
MW-4/26'	08/28/02	26	<10	--	--	<0.002	<0.002	<0.002	<0.004	<0.005	<0.005	<0.005	<0.005	<0.050

TABLE 3

SUMMARY OF SOIL SAMPLE ANALYTICAL RESULTS
ARCO Facility #5350
3804 Plaza Drive, Oceanside, CA

Concentrations are reported in milligrams per kilogram (mg/kg)

Sample Identification	Date Sampled	Depth (feet bgs)	TPHg	TPHd	TPH-Full	B	T	E	X	MTBE	DIPE	ETBE	TAME	TBA
MW-5/6'	08/28/02	6	<10	--	--	<0.002	<0.002	<0.002	<0.004	<0.005	<0.005	<0.005	<0.005	<0.050
MW-5/11'	08/28/02	11	<10	--	--	<0.002	<0.002	<0.002	<0.004	0.0083	<0.005	<0.005	<0.005	<0.050
MW-5/16'	08/28/02	16	<10	--	--	<0.002	<0.002	<0.002	<0.004	0.099	<0.005	<0.005	<0.005	0.180
MW-5/21'	08/28/02	21	<10	--	--	<0.002	<0.002	<0.002	<0.004	0.088	<0.005	<0.005	<0.005	0.110
MW-5/26'	08/28/02	26	<10	--	--	<0.002	<0.002	<0.002	<0.004	0.030	<0.005	<0.005	<0.005	<0.050
MW-5/31'	08/28/02	31	<10	--	--	<0.002	<0.002	<0.002	<0.004	0.028	<0.005	<0.005	<0.005	<0.050
MW-6/6'	08/28/02	6	<10	--	--	<0.002	<0.002	<0.002	<0.004	<0.005	<0.005	<0.005	<0.005	<0.050
MW-6/11'	08/28/02	11	<10	--	--	<0.002	<0.002	<0.002	<0.004	0.0061	<0.005	<0.005	<0.005	<0.050
MW-6/16'	08/28/02	16	<10	--	--	<0.002	0.0068	0.0029	0.016	0.082	<0.005	<0.005	<0.005	0.110
MW-6/21'	08/28/02	21	<10	--	--	<0.002	<0.002	<0.002	<0.004	0.280	<0.005	<0.005	<0.005	0.260
MW-6/26'	08/28/02	26	<10	--	--	0.073	0.0035	0.019	0.100	1.9	<0.005	<0.005	0.010	0.670
MW-6/31'	08/28/02	31	<10	--	--	<0.002	<0.002	<0.002	<0.004	0.270	<0.005	<0.005	<0.005	0.120
MW-7/5'	07/07/04	5	<10	--	--	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	<0.0050	<0.0050	<0.0050	<0.10
MW-7/10'	07/07/04	10	<10	--	--	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	<0.0050	<0.0050	<0.0050	<0.10
MW-7/15'	07/07/04	15	<10	--	--	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	<0.0050	<0.0050	<0.0050	<0.10
MW-7/20'	07/07/04	20	<10	--	--	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	<0.0050	<0.0050	<0.0050	<0.10
MW-7/25'	07/07/04	25	<10	--	--	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	<0.0050	<0.0050	<0.0050	<0.10
MW-8/5'	07/07/04	5	<10	--	--	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	<0.0050	<0.0050	<0.0050	<0.10
MW-8/10'	07/07/04	10	<10	--	--	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	<0.0050	<0.0050	<0.0050	<0.10
MW-8/15'	07/07/04	15	<10	--	--	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	<0.0050	<0.0050	<0.0050	<0.10
MW-8/20'	07/07/04	20	<10	--	--	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	<0.0050	<0.0050	<0.0050	<0.10
MW-8/25'	07/07/04	25	<10	--	--	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	<0.0050	<0.0050	<0.0050	<0.10
MW-9/5'	07/07/04	5	<10	--	--	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	<0.0050	<0.0050	<0.0050	<0.10
MW-9/10'	07/07/04	10	<10	--	--	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	<0.0050	<0.0050	<0.0050	<0.10
MW-9/15'	07/07/04	15	<10	--	--	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	<0.0050	<0.0050	<0.0050	<0.10
MW-9/20'	07/07/04	20	<10	--	--	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	<0.0050	<0.0050	<0.0050	<0.10
MW-9/25'	07/07/04	25	<10	--	--	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	<0.0050	<0.0050	<0.0050	<0.10

Notes:

D1/2.5' = Dispenser island soil sample identification and location reference / depth in feet below ground surface.

PPT@D7/2.5' = Product piping soil sample identification and location reference / depth in feet below ground surface.

MW-1/5' = Soil boring sample identification and location reference / depth in feet below ground surface.

TPHg = Total Petroleum Hydrocarbons as gasoline (Fuel Hydrocarbon Chain [C₆-C₁₂]; EPA Method 8015B).

TPHd = Total Petroleum Hydrocarbons as diesel (Fuel Hydrocarbon Chain [C₁₃-C₃₃]; EPA Method 8015B).

TPH-Full = Total Petroleum Hydrocarbons "Full Range" (Fuel Hydrocarbon Chain [C₆-C₃₂]; EPA Method 8015B).

< = Below method reporting limit shown.

-- = Sample not analyzed or not applicable.

B = Benzene (EPA Method 8260B).

T = Toluene (EPA Method 8260B).

E = Ethylbenzene (EPA Method 8260B).

X = Total xylenes (EPA Method 8260B).

MTBE = Methyl Tertiary Butyl Ether (EPA Method 8260B).

TBA = tert-Butanol (EPA Method 8260B).

DIPE = Di-isopropyl Ether (EPA Method 8260B).

ETBE = Ethyl tert-Butyl Ether (EPA Method 8260B).

TAME = tert-Amyl Methyl Ether (EPA Method 8260B).

TABLE 4

SUMMARY OF GROUNDWATER SAMPLE ANALYTICAL RESULTS, 2001 TO PRESENT

ARCO Facility #5350

All Results Reported in Micrograms per Liter (µg/L)

Well Identification	Sampling Date	TPHg	B	T	E	X	MTBE
MW-1	08/09/01	<500	<0.50	<0.50	<0.50	<1.5	1.3
	12/20/01	<500	<0.50	<0.50	<0.50	<1.5	1.0
	02/15/02	<500	<0.50	0.63	<0.50	<1.5	2.5
	05/02/02	<25	<0.51	1.63	<0.51	120	1.8
	07/15/02	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	10/16/02	<500	<0.50	<0.50	<0.50	<1.5	1.6
	01/09/03	<500	2.9	14	3.8	13	2.4
	04/25/03	<500	1.4	9.9	2.5	17	<1.0
	07/30/03	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	10/23/03	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	01/08/04	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	04/07/04	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	07/21/04	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	10/14/04	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	01/20/05	<100	<1.0	<1.0	<1.0	<1.0	<1.0
MW-2	08/09/01	31,000	2,900	5,200	1,100	9,100	15,000
	12/20/01	39,000	2,600	6,300	1,600	9,700	15,000
	02/15/02	35,000	3,300	7,200	1,800	11,000	18,000
	05/02/02	<3,100	<620	<620	<620	10,000	13,000
	07/15/02	32,000	2,400	6,000	1,400	8,500	13,000
	10/16/02	42,000	2,700	9,200	2,300	12,900	12,000
	01/09/03	51,000	3,000	9,600	2,200	13,000	11,000
	04/25/03	48,000	2,700	8,100	2,000	12,000	9,200
	07/30/03	51,000	2,500	9,200	2,500	13,000	6,100
	10/23/03	34,000	1,800	5,200	1,800	10,000	5,100
	01/08/04	41,000	2,100	7,500	2,500	15,000	5,200
	04/07/04	41,000	1,700	6,400	2,400	14,000	3,200
	07/21/04	52,000	1,100	5,200	2,200	11,000	2,500
	10/14/04	41,000	22	120	51	270	40
	01/20/05	31,000	230	3,400	2,400	14,000	340
MW-3	08/09/01	<500	<0.50	<0.50	<0.50	<1.5	2.2
	12/20/01	<500	<0.50	0.71	<0.50	1.8	1.1
	02/15/02	<500	<0.50	<0.50	<0.50	<1.5	1.8
	05/02/02	<25	<5.0	<5.0	<5.0	2.3	<1.0
	07/15/02	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	10/16/02	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	01/09/03	<500	1.8	11	4.5	24	1.4
	04/25/03	<500	3.0	21	5.2	30	<1.0
	07/30/03	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	10/23/03	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	01/08/04	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	04/07/04	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	07/21/04	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	10/14/04	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	01/20/05	<100	<1.0	<1.0	<1.0	<1.0	<1.0
MW-4	09/09/02	<50	<2.0	<2.0	<2.0	<4.0	<5.0
	10/16/02	<500	<0.50	<0.50	<0.50	<1.5	1.9
	01/09/03	<500	0.80	4.0	2.1	9.7	1.9
	04/25/03	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	07/30/03	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	10/23/03	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	01/08/04	Well Not Sampled					

TABLE 4

SUMMARY OF GROUNDWATER SAMPLE ANALYTICAL RESULTS, 2001 TO PRESENT

ARCO Facility #5350

All Results Reported In Micrograms per Liter (µg/L)

Well Identification	Sampling Date	TPHg	B	T	E	X	MTBE
MW-4 cont'd	01/22/04	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	04/07/04	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	07/21/04	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	10/14/04	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	01/20/05	<100	<1.0	<1.0	<1.0	<1.0	<1.0
MW-5	09/09/02	57	<2.0	<2.0	<2.0	<4.0	4,400
	10/16/02	4,100	<25	34	260	690	6,800
	01/09/03	4,500	<25	<25	500	<75	4,200
	04/25/03	6,500	<25	<25	940	<75	4,500
	07/30/03	5,200	38	<25	980	<75	4,300
	10/23/03	4,300	40	<25	970	<75	4,900
	01/08/04	Well Not Sampled					
	01/22/04	3,100	<25	<25	500	<75	3,400
	04/07/04	3,500	<25	<25	660	<75	2,000
	07/21/04	2,800	9.7	<5.0	260	21	1,000
	10/14/04	1,800	<5.0	<5.0	83	<15	900
	01/20/05	1,400	<5.0	<5.0	65	<5.0	390
MW-6	09/11/02	16,000	3,500	<2,000	<2,000	<4,000	61,000
	10/16/02	24,000	4,100	5,400	1,200	4,900	46,000
	01/09/03	26,000	4,200	4,800	1,300	4,400	47,000
	04/25/03	39,000	3,800	7,600	1,300	6,100	32,000
	07/30/03	27,000	3,700	6,000	1,500	6,300	40,000
	10/23/03	26,000	3,200	3,700	1,200	5,300	32,000
	01/08/04	21,000	2,900	2,100	1,000	4,900	35,000
	04/07/04	24,000	3,800	5,700	1,700	8,300	29,000
	07/21/04	31,000	3,300	4,700	1,900	8,600	22,000
	10/14/04	29,000	3,300	3,800	2,200	10,000	25,000
	01/20/05	20,000	1,800	1,600	1,600	6,300	5,600
MW-7	07/21/04	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	10/14/04	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	01/20/05	<100	<1.0	<1.0	<1.0	<1.0	<1.0
MW-8	07/23/04	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	10/14/04	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	01/20/05	<100	<1.0	<1.0	<1.0	<1.0	<1.0
MW-9	07/21/04	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	10/14/04	<500	<0.50	<0.50	<0.50	<1.5	<1.0
	01/20/05	<100	<1.0	<1.0	<1.0	<1.0	<1.0

Notes:

TPHg = Total petroleum hydrocarbons (DHS Modified EPA Method 8015)

B = Benzene

T = Toluene

E = Ethylbenzene

X = Total Xylenes

MTBE = Methyl tert-Butyl Ether

< = Less than indicated reporting limit

BTEX and MTBE were analyzed by EPA Method 8260B

TABLE 5

SUMMARY OF ADDITIONAL OXYGENATES ANALYTICAL DATA, 2001 TO PRESENT

ARCO Facility #5350

All Results Reported in Micrograms per Liter (µg/L)

Well Identification	Sampling Date	TBA	DIPE	ETBE	TAME	Ethanol
MW-1	08/09/01	<25	<5.0	<5.0	<5.0	--
	12/20/01	<25	<5.0	<5.0	<5.0	--
	02/15/02	<25	<5.0	<5.0	<5.0	--
	05/02/02	<25	<5.0	<5.0	<5.0	--
	07/15/02	<25	<5.0	<5.0	<5.0	--
	10/16/02	<50	<5.0	<5.0	<5.0	--
	01/09/03	<50	<5.0	<5.0	<5.0	<150
	04/25/03	<50	<5.0	<5.0	<5.0	<150
	07/30/03	<50	<5.0	<5.0	<5.0	<150
	10/23/03	<50	<5.0	<5.0	<5.0	<150
	01/08/04	<50	<5.0	<5.0	<5.0	<150
	04/07/04	<50	<5.0	<5.0	<5.0	<150
	07/21/04	<50	<5.0	<5.0	<5.0	<150
	10/14/04	<50	<5.0	<5.0	<5.0	<150
	01/20/05	<25	<2.0	<2.0	<2.0	<500
MW-2	08/09/01	3,700	<200	<200	<200	--
	12/20/01	5,400	<200	<200	<200	--
	02/15/02	<3,100	<620	<620	<620	--
	05/02/02	3,500	<500	<500	<500	--
	07/15/02	<3,100	<620	<620	<620	--
	10/16/02	<5,000	<500	<500	<500	--
	01/09/03	<10,000	<1,000	<1,000	<1,000	<30,000
	04/25/03	<10,000	<1,000	<1,000	<1,000	<30,000
	07/30/03	<5,000	<500	<500	<500	<15,000
	10/23/03	<2,500	<250	<250	<250	<7,500
	01/08/04	<5,000	<500	<500	<500	<15,000
	04/07/04	<5,000	<500	<500	<500	<15,000
	07/21/04	<2,500	<250	<250	<250	<7,500
	10/14/04	<50	<5.0	<5.0	<5.0	<150
	01/20/05	<3,100	<250	<250	<250	<62,000
MW-3	08/09/01	<25	<5.0	<5.0	<5.0	--
	12/20/01	<25	<5.0	<5.0	<5.0	--
	02/15/02	<25	<5.0	<5.0	<5.0	--
	05/02/02	<25	<5.0	<5.0	<5.0	--
	07/15/02	<25	<5.0	<5.0	<5.0	--
	10/16/02	<50	<5.0	<5.0	<5.0	--
	01/09/03	<50	<5.0	<5.0	<5.0	<150
	04/25/03	<50	<5.0	<5.0	<5.0	<150
	07/30/03	<50	<5.0	<5.0	<5.0	<150
	10/23/03	<50	<5.0	<5.0	<5.0	<150
	01/08/04	<50	<5.0	<5.0	<5.0	<150
	04/07/04	<50	<5.0	<5.0	<5.0	<150
	07/21/04	<50	<5.0	<5.0	<5.0	<150
	10/14/04	<50	<5.0	<5.0	<5.0	<150
	01/20/05	<25	<2.0	<2.0	<2.0	<500
MW-4	09/09/02	<50	<5.0	<5.0	<5.0	--
	10/16/02	<50	<5.0	<5.0	<5.0	--
	01/09/03	<50	<5.0	<5.0	<5.0	<150
	04/25/03	<50	<5.0	<5.0	<5.0	<150
	07/30/03	<50	<5.0	<5.0	<5.0	<150
	10/23/03	<50	<5.0	<5.0	<5.0	<150
	01/22/04	<50	<5.0	<5.0	<5.0	<150

TABLE 5

SUMMARY OF ADDITIONAL OXYGENATES ANALYTICAL DATA, 2001 TO PRESENT

ARCO Facility #5350

All Results Reported in Micrograms per Liter (µg/L)

Well Identification	Sampling Date	TBA	DIPE	ETBE	TAME	Ethanol
MW-4 cont'd	04/07/04	<50	<5.0	<5.0	<5.0	<150
	07/21/04	<50	<5.0	<5.0	<5.0	<150
	10/14/04	<50	<5.0	<5.0	<5.0	<150
	01/20/05	<25	<2.0	<2.0	<2.0	<500
MW-5	09/09/02	<2,500	<250	<250	<250	--
	10/16/02	<2,500	<250	<250	<250	--
	01/09/03	<2,500	<250	<250	<250	<7,500
	04/25/03	<2,500	<250	<250	<250	<7,500
	07/30/03	<2,500	<250	<250	<250	<7,500
	10/23/03	2,900	<250	<250	<250	<7,500
	01/22/04	<2,500	<250	<250	<250	<7,500
	04/07/04	<2,500	<250	<250	<250	<7,500
	07/21/04	<500	<50	<50	<50	<1,500
	10/14/04	<500	<50	<50	<50	<1,500
	01/20/05	<120	<10	<10	<10	<2,500
MW-6	09/11/02	<50,000	<5,000	<5,000	<5,000	--
	10/16/02	<50,000	<5,000	<5,000	<5,000	--
	01/09/03	<20,000	<2,000	<2,000	<2,000	<60,000
	04/25/03	<20,000	<2,000	<2,000	<2,000	<60,000
	07/30/03	<10,000	<1,000	<1,000	<1,000	<30,000
	10/23/03	<50,000	<5,000	<5,000	<5,000	<150,000
	01/08/04	<20,000	<2,000	<2,000	<2,000	<60,000
	04/07/04	<20,000	<2,000	<2,000	<2,000	<60,000
	07/21/04	<10,000	<1,000	<1,000	<1,000	<30,000
	10/14/04	<12,000	<1,200	<1,200	<1,200	<38,000
	01/20/05	<3,100	<250	<250	<250	<62,000
MW-7	07/21/04	<50	<5.0	<5.0	<5.0	<150
	10/14/04	<50	<5.0	<5.0	<5.0	<150
	01/20/05	<25	<2.0	<2.0	<2.0	<500
MW-8	07/23/04	<50	<5.0	<5.0	<5.0	<150
	10/14/04	<50	<5.0	<5.0	<5.0	<150
	01/20/05	<25	<2.0	<2.0	<2.0	<500
MW-9	07/21/04	<50	<5.0	<5.0	<5.0	<150
	10/14/04	<50	<5.0	<5.0	<5.0	<150
	01/20/05	<25	<2.0	<2.0	<2.0	<500

Notes:

TBA = tert-Butyl Alcohol
 DIPE = Di-isopropyl Ether
 ETBE = Ethyl tert-Butyl Ether
 TAME = tert-Amyl Methyl Ether

Samples analyzed by EPA Method 8260B
 < = Less than indicated reporting limit
 -- = Not analyzed

TABLE 6

SUMMARY OF BASELINE NATURAL ATTENUATION DATA
ARCO Facility #5350

All Results Reported in Micrograms per Liter (µg/L), unless otherwise noted

Well Identification	Sampling Date	Petroleum Hydrocarbon Concentrations						Indicators of Natural Attenuation and General Groundwater Parameters									
		GRO	B	T	E	X	MTBE	DO (mg/L)	ORP (mV)	Sp Cond (s/m)	pH ¹	Temp (°C)	Nitrate	Sulfate	Methane	Total Iron	Ferrous Iron
MW-1	01/20/05	<100	<1.0	<1.0	<1.0	<1.0	<1.0	6.78	190	0.990	6.98	24.2	4,590	442,000	<1.0	366	<200
MW-2	01/20/05	31,000	230	3,400	2,400	14,000	340	6.66	33	0.589	7.12	25.5	<100	2,480	510	1,620	1,100
MW-3	01/20/05	<100	<1.0	<1.0	<1.0	<1.0	<1.0	6.78	128	0.900	7.03	24.7	4,230	374,000	<1.0	590	<200
MW-4	01/20/05	<100	<1.0	<1.0	<1.0	<1.0	<1.0	6.37	130	0.932	6.86	23.1	713	689,000	<1.0	176	<200
MW-5	01/20/05	1,400	<5.0	<5.0	65	<5.0	390	3.16	-7	0.491	7.18	24.9	<100	806,000	370	670	<200
MW-6	01/20/05	20,000	1,800	1,600	1,600	6,300	5,600	3.97	19	0.604	7.08	24.6	<100	49,500	370	836	853
MW-7	01/20/05	<100	<1.0	<1.0	<1.0	<1.0	<1.0	7.10	140	0.329	7.20	24.2	192	449,000	<1.0	301	<200
MW-8	01/20/05	<100	<1.0	<1.0	<1.0	<1.0	<1.0	4.15	140	0.370	7.19	24.3	183	325,000	<1.0	435	<200
MW-9	01/20/05	<100	<1.0	<1.0	<1.0	<1.0	<1.0	6.55	165	0.645	7.10	24.6	1,020	453,000	<1.0	172	<200

- Notes:
- GRO = Gasoline range organics (C₆-C₁₂) (EPA Method 8015M)
 - BTEX = Benzene, toluene, ethylbenzene, and total xylenes (EPA Method 8260B)
 - MTBE = Methyl tert-butyl ether (EPA Method 8260B)
 - Nitrate = Nitrate as nitrogen (EPA Method 300.0)
 - Sulfate = Sulfate (EPA Method 300.0)
 - Methane = Methane (Method RSK-175 Mod)
 - Total Iron = Total Iron (EPA Method 6010B)
 - Fe II = Ferrous iron (EPA Method 3500D)
 - DO = Dissolved Oxygen (field measurement)
 - ORP = Oxidation-reduction potential (field measurement)
 - Sp Cond = Specific conductivity (field measurement)
 - pH = pH (field measurement)
 - Temp = Temperature (field measurement)
 - µg/L = Micrograms per Liter
 - mg/L = Milligrams per Liter
 - mV = Millivolts
 - S/m = Siemens per meter
 - °C = Degrees celsius
 - < = Analytical results less than laboratory reporting limit shown

TABLE 7
CONTAMINANT CHARACTERISTICS
ARCO Facility #5350

Compound/ Chemical	CAS #	Molecular Weight	Pure Phase Solubility ^(1,2) (mg/L)	log Koc ^(1,2) (log l/kg)	Vapor Pressure ^(1,2) (mm Hg)	Henry's Law Constant ^(1,2) (dimensionless)	Flash Point ^(1,2) (C)	Boiling Point ^(1,2) (C)	State of California Drinking Water MCL ⁽³⁾ (µg/L)	EPA Region 9 Preliminary Remediation Goals ⁽⁴⁾			
										Residential Soil (mg/kg)	Industrial Soil (mg/kg)	Ambient Air (µg/m ³)	Tap Water (µg/L)
Gasoline	8006-61-9	~ 95	NA	NA	NA	NA	-45.6	32-225	NA	NA	NA	NA	NA
Benzene	71-43-2	78.11	1780	1.79	76 - 95.2	0.23	-11	80.1	0.001	0.64	1.4	0.25	0.35
methyl tert-butyl ether (MTBE)	1634-04-4	88.15	43,000-54,300	1.0-1.1	245-256	0.024	-28	55.2	0.013	32	70	7.4	11
tert-butanol (TBA)	75-65-0	74.12	Miscible	1.57	40-42	0.00048-0.00059	4	82.2	NA	NA	NA	NA	NA
tert-amyl methyl ether (TAME)	994-05-8	102.18	20,000	1.3-2.2	68.3	0.052	-11	85-86	NA	NA	NA	NA	NA

Notes:

µg/L micrograms per liter

mg/kg milligrams per kilogram

µg/m³ micrograms per cubic meter

C temperature in degrees Celsius

mm Hg pressure in millimeters of mercury

log l/kg a measure of the propensity of a compound to adsorb onto carbon in the soil matrix

Koc soil sorption coefficient

MCL California Maximum Contaminant Level in groundwater promulgated by California Environmental Protection Agency (CalEPA)

Pure Phase Solubility – The tendency of a chemical to dissolve in water, expressed as milligrams of a chemical that will dissolve in one liter of water.

Soil sorption coefficient (log Koc) - The tendency of a chemical to adsorb to soil, expressed as the ratio of a chemical that will adsorb onto organic carbon to the concentration of the chemical that dissolves in water;

Vapor pressure – The tendency of a chemical to migrate from a pure liquid phase to a gas phase, expressed as the pressure exerted by a chemical in the gas phase when it is in equilibrium with the liquid phase.

Henry's law constant – The tendency of a chemical to partition between the dissolved phase and the gas phase, expressed as the ratio of the equilibrium concentration of the chemical in the gas phase to the equilibrium concentration of the chemical in water.

(1) Guidelines for Investigation and Cleanup of MTBE and Other Ether-Based Oxygenates, 2000, California State Water Resources Control Board, Final Draft, 3/27/00

(2) San Diego County, Department of Environmental Health, Site Assessment and Mitigation Program, Vapor Risk Model, http://www.co.san-diego.ca.us/deh/lwq/sam/docs/vapor_risk-2000_rev-08-25-2003.xls

(3) A Compilation of Water Quality Goals, California Environmental Protection Agency, Regional Water Quality Control Board, Central Valley Region, August 2000

(4) U.S. Environmental Protection Agency, Region 9 Preliminary Remediation Goals, <http://www.epa.gov/region09/waste/sfund/prg/files/04prgtable.pdf> dated October 2004. These goals assume direct exposure to the contaminants.

Table 8
Remedial Technology Screening Matrix
ARCO Facility #5350
3804 Plaza Drive, Oceanside, CA

	Technology	Description	Retained	Comments
1.	Groundwater Extraction	Conventional groundwater extraction (GWE) methods involve pumping impacted groundwater to either a treatment system or an above ground storage tank on-site. Groundwater treated on-site is discharged or re-injected to the aquifer. Groundwater stored on-site is transported to a waste disposal facility for treatment and disposal. GWE systems are used primarily to accomplish hydraulic containment and/or to reduce the dissolved contaminant concentrations in the aquifer to meet cleanup objectives.	Yes	Considered to be a viable remediation alternative.
2.	Excavation and Off-Site Disposal	Excavation removes contaminated material from a hazardous waste site using heavy construction equipment, such as backhoes, bulldozers, and front loaders. At certain sites, specially designed equipment may be used to prevent the spread of contaminants. The excavated material is commonly landfilled at an approved off-site disposal facility, but can also be remediated on site and reused.	No	Excavation would not remediate MTBE in groundwater. Excavation would also interfere with the operation of the station.
3.	Soil Vapor Extraction (1)	Soil vapor extraction (SVE), also known as "soil venting" or "vacuum extraction", is an <i>in situ</i> remedial technology that reduces concentrations of volatile constituents in petroleum products adsorbed to soils in the unsaturated (vadose) zone. In this technology, a vacuum is applied through wells near the source of contamination in the soil. Volatile constituents of the contaminant mass "evaporate" and the vapors are drawn toward the extraction wells. Extracted vapor is then treated as necessary before being released to the atmosphere. The increased airflow through the subsurface can also stimulate biodegradation of some of the contaminants, especially those that are less volatile. Wells may be either vertical or horizontal. In areas of high groundwater levels, water table depression pumps may be required to offset the effect of upwelling induced by the vacuum.	No	Limited areas of hydrocarbon impacted soil (TPHg \geq 100 mg/kg) are present beneath the site.
4.	Dual-Phase Extraction (1)	Dual-phase extraction (DPE), also known as multi-phase extraction, vacuum-enhanced extraction, or sometimes bioslurping, is an <i>in-situ</i> technology that uses pumps to remove various combinations of contaminated groundwater, separate-phase petroleum product, and hydrocarbon vapor from the subsurface. Extracted liquids and vapor are treated and collected for disposal, or re-injected to the subsurface (where permissible under applicable state laws).	Yes	Considered to be a viable remediation alternative.
5.	Air Sparging w/ Soil Vapor Extraction (1)	Air sparging is an <i>in situ</i> remedial technology that reduces concentrations of volatile constituents in petroleum products that are adsorbed to soils and dissolved in groundwater. This technology, which is also known as " <i>in situ</i> air stripping" and " <i>in situ</i> volatilization," involves the injection of contaminant-free air into the subsurface saturated zone, enabling a phase transfer of hydrocarbons from a dissolved state to a vapor phase. The air is then vented through the unsaturated zone. Air sparging is most often used together with soil vapor extraction (SVE), but it can also be used with other remedial technologies. When air sparging (AS) is combined with SVE, the SVE system creates a negative pressure in the unsaturated zone through a series of extraction wells to control the vapor plume migration. This combined system is called AS/SVE.	No	Limited areas of hydrocarbon impacted soil (TPHg \geq 100 mg/kg) are present beneath the site.
6.	In-Situ Enhanced Bioremediation (1)	In-situ groundwater bioremediation is a technology that encourages growth and reproduction of indigenous microorganisms to enhance biodegradation of organic constituents in the saturated zone. In-situ groundwater bioremediation can effectively degrade organic constituents which are dissolved in groundwater and adsorbed onto the aquifer matrix.	Yes	Would likely require the addition of specialized microbes to the saturated zone to address MTBE.
7.	Low-Temperature Thermal Desorption (1)	Low-Temperature Thermal Desorption (LTTD), also known as low-temperature thermal volatilization, thermal stripping, and soil roasting, is an ex-situ remedial technology that uses heat to physically separate petroleum hydrocarbons from excavated soils. Thermal desorbers are designed to heat soils to temperatures sufficient to cause constituents to volatilize and desorb (physically separate) from the soil. Although they are not designed to decompose organic constituents, thermal desorbers can, depending upon the specific organics present and the temperature of the desorber system, cause some of the constituents to completely or partially decompose. The vaporized hydrocarbons are generally treated in a secondary treatment unit (e.g., an afterburner, catalytic oxidation chamber, condenser, or carbon adsorption unit) prior to discharge to the atmosphere. Afterburners and oxidizers destroy the organic constituents. Condensers and carbon adsorption units trap organic compounds for subsequent treatment or disposal. Some pre- and post-processing of soil is necessary when using LTTD. Excavated soils are first screened to remove large (greater than 2 inches in diameter) objects. These may be sized (e.g., crushed or shredded) and then introduced back into the feed material. After leaving the desorber, soils are cooled, re-moistened to control dust, and stabilized (if necessary) to prepare them for disposal/reuse. Treated soil may be redeposited onsite, used as cover in landfills, or incorporated into asphalt.	No	Ex-situ soil treatment performed on site would not be practical due to ongoing operation of the gas station.

Table 8 (cont.)
Remedial Technology Screening Matrix
ARCO Facility #5350
3804 Plaza Drive, Oceanside, CA

	Technology	Description	Retained	Comments
8.	Landfarming (1)	Landfarming, also known as land treatment or land application, is an above-ground remediation technology for soils that reduces concentrations of petroleum constituents through biodegradation. This technology usually involves spreading excavated contaminated soils in a thin layer on the ground surface and stimulating aerobic microbial activity within the soils through aeration and/or the addition of minerals, nutrients, and moisture. The enhanced microbial activity results in degradation of adsorbed petroleum product constituents through microbial respiration. If contaminated soils are shallow (<i>i.e.</i> , less than 3 feet below ground surface), it may be possible to effectively stimulate microbial activity without excavating the soils. If petroleum-contaminated soil is deeper than 5 feet, the soils should be excavated and reapplied on the ground surface.	No	Ex-situ soil treatment performed on site not practical due to ongoing operation of the gas station.
9.	Biopiles (1)	Biopiles, also known as biocells, bioheaps, biomounds, and compost piles, are used to reduce concentrations of petroleum constituents in excavated soils through the use of biodegradation. This technology involves heaping contaminated soils into piles (or "cells") and stimulating aerobic microbial activity within the soils through the aeration and/or addition of minerals, nutrients, and moisture. The enhanced microbial activity results in degradation of adsorbed petroleum-product constituents through microbial respiration. Biopiles are similar to landfarms in that they are both above-ground, engineered systems that use oxygen, generally from air, to stimulate the growth and reproduction of aerobic bacteria which, in turn, degrade the petroleum constituents adsorbed to soil. While landfarms are aerated by tilling or plowing, biopiles are aerated most often by forcing air to move by injection or extraction through slotted or perforated piping placed throughout the pile.	No	Ex-situ soil treatment performed on site not practical due to ongoing operation of the gas station.
10.	Bioventing (1)	Bioventing is an in situ remediation technology that uses indigenous microorganisms to biodegrade organic constituents adsorbed to soils in the unsaturated zone. Soils in the capillary fringe and the saturated zone are not affected. In bioventing, the activity of the indigenous bacteria is enhanced by inducing air (or oxygen) flow into the unsaturated zone (using extraction or injection wells) and, if necessary, by adding nutrients. When extraction wells are used for bioventing, the process is similar to soil vapor extraction (SVE). However, while SVE removes constituents primarily through volatilization, bioventing systems promote biodegradation of constituents and minimize volatilization (generally by using lower air flow rates than for SVE). In practice, some degree of volatilization and biodegradation occurs when either SVE or bioventing is used.	No	Would not address impacted saturated zone and would not be aggressive enough to address impacted vadose zone.
11.	Biosparging (1)	Biosparging is an in-situ remediation technology that uses indigenous microorganisms to biodegrade organic constituents in the saturated zone. In biosparging, air (or oxygen) and nutrients (if needed) are injected into the saturated zone to increase the biological activity of the indigenous microorganisms. Biosparging can be used to reduce concentrations of petroleum constituents that are dissolved in groundwater, adsorbed to soil below the water table, and within the capillary fringe. Although constituents adsorbed to soils in the unsaturated zone can also be treated by biosparging, bioventing is typically more effective for this situation. When volatile constituents are present, biosparging is often combined with soil vapor extraction (SVE) or bioventing and can also be used with other remedial technologies. When biosparging is combined with vapor extraction, the vapor extraction system creates a negative pressure in the vadose zone through a series of extraction wells that control the vapor plume migration.	No	Essentially the same as air sparging combined with SVE. See comments for remedial technology # 5.
12.	In Situ Chemical Oxidation	In Situ Chemical Oxidation (ISCO) involves injecting chemical oxidants (e.g. Fenton's Reagent, KMnO ₄ , Ozone, H ₂ O ₂) into the vadose zone and/or ground water to oxidize contaminants. This is an emerging technology that can be applied at highly contaminated sites or source areas to reduce contaminant concentrations. This technology, generally, is not cost effective for plumes with low contaminant concentrations. The effectiveness of ISCO is sensitive to variations in the hydraulic conductivity of the soil as well as to the distribution of contaminant mass.	No	Not feasible due to the MTBE impact of groundwater.
13.	Monitoring Natural Attenuation	Monitored Natural Attenuation (MNA) is not a "technology", per se. It generally describes a range of physical and biological processes, which, unaided by deliberate human intervention, reduce the concentration, toxicity, or mobility of contaminants in soil and/or groundwater. These processes take place whether or not other active cleanup measures are in place. However, techniques and technologies for predicting and monitoring natural attenuation have been developed. MNA refers to the use of these techniques to monitor and document the progress of natural attenuation at a site.	Yes	Considered to be a viable remediation alternative.
14.	Containment/Isolation	Contaminated soil and/or groundwater is isolated from receptors by various methods such as capping, chemical/physical stabilization, or the construction of containment cells or barriers.	No	Not feasible for remediating MTBE impacted groundwater.

Notes: (1) Technology descriptions obtained from "How to Evaluate Alternative Cleanup Technologies for Underground Storage Tank Sites: A Guide for Corrective Action Plan Reviewers.", EPA - May 1995.

TABLE 9

**COST ESTIMATE FOR ALTERNATIVE 1 - TWO (2) 96-HOUR
HIGH-VACUUM DUAL-PHASE EXTRACTION EVENTS
ARCO Facility #5350**

Capital Equipment and Construction

Total Cap/Const	\$0
------------------------	------------

Periodic HVDPE Costs

Number of 96-hour MRS events (events per month)	2
Mobile DPE Unit Costs (\$/96-hr event)	\$15,000.00
Transportation and Disposal Fees (\$/event)	\$7,500.00
Total DPE Event Costs (incl Utilities)	\$45,000

Total Cost	\$45,000
-------------------	-----------------

TABLE 10

**COST ESTIMATE FOR ALTERNATIVE 2 - IN-SITU ENHANCED
 BIOREMEDIATION (OXYGEN-RELEASING COMPOUND)
 ARCO Facility #5350**

ORC Installation Costs

Pounds of ORC needed	100
Cost per Pound of ORC	\$10
Misc Parts	\$1,000
System Construction	\$0
Total Capital Cost	\$2,000

Drilling Costs

Number Borings needed for ORC	12
Depth per Boring	20
Drillers Cost (\$/ft)*	\$40
Permits	\$660
Supervision/Permits/Etc	\$4,000
Total Drilling Costs	\$14,260

O&M Costs

Total O&M Costs (incl Utilities)	\$0
----------------------------------	-----

Total Cost	\$16,260
-------------------	-----------------

*Drillers per foot cost includes mobilization/demobilization, boring advancement, and materials.

TABLE 11

COST ESTIMATE FOR ALTERNATIVE 3 - REMEDIATION BY NATURAL
ARCO Facility #5350

Capital Equipment and Construction

Total Cap/Const	\$0
-----------------	-----

Utility Costs

Monthly Utilities	\$0
-------------------	-----

O&M Costs

Total O&M Costs (incl Utilities)	\$0
----------------------------------	-----

Total Cost	\$0
-------------------	------------

TABLE 12
EVALUATION MATRIX FOR REMEDIAL ALTERNATIVES
ARCO FACILITY #5350

Evaluation Criteria	Alternative 1 – High-Vacuum Dual Phase Extraction (two 96 hour events)	Alternative 2 – Enhanced Bioremediation with Oxygen-Releasing Compound	Alternative 3 – Remediation by Natural Attenuation
1. Description of Alternative	SECOR's Mobile Remediation System will be used to remediate the impacted soil and groundwater with two 96-hour events on monitoring wells MW-2, MW-5, and MW-6.	Oxygen Releasing Compound (ORC) is injected as a slurry into the impacted groundwater zone using a direct-push rig. The ORC releases oxygen, increasing the rate of biodegradation.	Dissolved hydrocarbon plume is allowed to reach State Maximum Contaminant Levels by natural attenuation.
2. Level of Protection of Human Health, the Environment, and Beneficial Uses of Ground and Surface Waters	This alternative provides an adequate level of protection of human health, the environment, and beneficial uses of ground and surface waters. Implementation will slightly increase the potential exposure of humans and the environment through the extraction, treatment, and discharge of impacted soil vapor. This potential exposure would be limited to the event time span.	This alternative provides an adequate level of protection of human health, the environment, and beneficial uses of ground and surface waters. Implementation would not significantly increase the potential exposure of humans to hydrocarbon impacted soil and groundwater.	This alternative provides an adequate level of protection of human health, the environment, and beneficial uses of ground and surface waters. Implementation would not significantly increase the potential exposure of humans to hydrocarbon impacted soil and groundwater.
3. Reduction of Hydrocarbons	This alternative will reduce the concentration of contaminants below the site in the vadose and saturated zones.	This alternative will reduce the concentration of contaminants dissolved in groundwater and adsorbed to soil in the saturated zone.	This alternative will reduce the concentration of contaminants dissolved in groundwater and adsorbed to soil in the saturated zone.
4. Implementation and Operation	Moderately easy to implement. Requires power/gas, and 24-hour operator and security. Minor disruption to local traffic, business operations for the site and neighboring sites during the events.	Easy to implement. Minor disruptions to business operations during installation of ORC.	Easy to implement. No disruptions to business operations during implementation.

TABLE 12 (cont.)
EVALUATION MATRIX FOR REMEDIAL ALTERNATIVES
ARCO FACILITY #5350

Evaluation Criteria	Alternative 1 – High-Vacuum Dual Phase Extraction (two 96 hour events)	Alternative 2 – Enhanced Bioremediation with Oxygen-Releasing Compound	Alternative 3 – Remediation by Natural Attenuation
5. Cost Effectiveness	Cost Estimate = \$45,000	Cost Estimate = \$16,260	Cost Estimate = \$0
6. Compliance with Regulatory Guidelines	This alternative can be implemented within regulatory guidelines.	This alternative can be implemented within regulatory guidelines.	This alternative can be implemented within regulatory guidelines.
7. Short Term Effectiveness	This alternative is effective in the short term.	Same as Alternative 1.	This alternative is effective in the short term because natural attenuation processes appear to be occurring.
8. Long Term Effectiveness	Effective in the long term.	Same as Alternative 1.	Same as Alternative 1.
9. Community Exceptionance	No community acceptance problems anticipated for this alternative.	The impact to the nearby community and population would be negligible.	The impact to the nearby community and population would be negligible.
10. Impacts on Water Conservation	This alternative would have a slight negative impact on water conservation	This alternative would not impact water conservation either negatively or positively.	This alternative would not impact water conservation either negatively or positively.

TABLE 13

CONCENTRATION TREND ANALYSIS SUMMARY
ARCO Facility #5350

Well	Compound Evaluated	Max Contaminant Level - C_{MCL} ⁽¹⁾ (ug/L)	Initial Max. Concentration - C_0 (ug/L) ⁽²⁾	Sampling Date for C_0	Current Reference Date Used	Estimated Degradation Rate Constant - k (day ⁻¹)	Time to Reach MCL from C_0 - t (days)	Current Elapsed Time from Date C_0 Reported (days)	Estimated Time to Reach C_{MCL} from Current Reference Date (yrs)
MW-2	Benzene	1	3,300	2/15/2002	3/31/2005	0.0021	3,858	1,140	7.45
MW-2	MTBE	13	18,000	2/15/2002	3/31/2005	0.0032	2,260	1,140	3.07
MW-5	MTBE	13	6,800	10/16/2002	3/31/2005	0.0027	2,318	897	3.89
MW-6	Benzene	1	4,200	1/9/2003	3/31/2005	0.0007	11,918	812	30.43
MW-6	MTBE	13	61,000	9/11/2002	3/31/2005	0.0018	4,696	932	10.31

Notes: Equation used to estimate time to reach MCL is $C = C_0 e^{-kt}$, where:

C = Concentration at time t

C_0 = Initial Concentration

k = Degradation rate constant (time⁻¹)

t = time

(1) State of California Primary Maximum Contaminant Level (MCL) for Drinking Water

(2) Maximum concentration from groundwater monitoring data

APPENDICES

APPENDIX A
BORING/WELL LOGS
CORRECTIVE ACTION PLAN
ATLANTIC RICHFIELD COMPANY
ARCO Facility #5350
3804 Plaza Drive
Oceanside, California
Unauthorized Release #H20645-001
SECOR PROJECT NO. 08BP.05350.05
April 21, 2005

DEFINITION OF TERMS

PRIMARY DIVISIONS			GRAPHIC SYMBOL	GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS More Than Half Of Material Is Larger Than No. 200 Sieve Size	GRAVELS More Than Half Of Coarse Fraction Is Larger Than No. 4 Sieve	Clean Gravels (Less Than 5% Fines)		GW	Well graded gravels, gravel-sand mixtures, little or no fines.
		Gravel With Fines		GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
				GM	Clayey gravels, gravel-sand-clay mixtures, non-plastic fines.
				GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS More Than Half Of Coarse Fraction Is Smaller Than No. 4 Sieve	Clean Sands (Less Than 5% Fines)		SW	Well graded sands or gravelly sands, little or no fines.
		Sands With Fines		SP	Poorly graded sands or gravelly sands, little or no fines.
				SM	Silty sands, sand-silt mixtures, plastic fines.
				SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS More Than Half Of Material Is Smaller Than No. 200 Sieve Size	SILTS AND CLAYS Liquid Limit Is Less Than 50%			ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
				CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
				OL	Organic silts and organic silty clays of low plasticity.
			SILTS AND CLAYS Liquid Limit Is Greater Than 50%		
				CH	Inorganic clays of high plasticity, fat clays.
				OH	Organic clays of medium to high plasticity, organic silts.
			HIGHLY ORGANIC SOILS		
				Dg	Decomposed granite.

SECOR

INTERNATIONAL INCORPORATED
2655 CAMINO DEL RIO N., SUITE 302
SAN DIEGO, CA. 92108

BOREHOLE/WELL LOG LEGEND

Page 1 of 2

GRAIN SIZES

U.S. Standard Series Sieve					Clear Square Sieve Openings		
200	40	10	4	3/4"	3"	12"	
SILT and CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Coarse		

RELATIVE DENSITY

Sand and Gravels	Blows/Foot [†]
Very Loose	0 - 4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

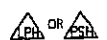
CONSISTENCY

Silt and Clays	Strength *	Blows/Foot [†]
Very Loose	0 - 1/4	0 - 2
Soft	1/4 - 1/2	2 - 4
Firm	1/2 - 1	2 - 4
Stiff	1 - 2	8 - 16
Very Stiff	2 - 4	16 - 32
Hard	Over 4	Over 32

* Number of blows of 140 pound hammer falling approximately 30 inches to drive a 2 inch O.D. (1-3/8 inch I.D.) standard penetration test (SPT) split spoon (ASTM D-1586).

* Unconfined compressive strength in tons/sq.ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D-1586), pocket penetrometer, torvane, or visual observation.

Graphic Log Symbols



Liquid-Phase Hydrocarbons/ Phase Separated Hydrocarbons



Ground Water (Static)



Ground Water (First Encountered)

Well Design Symbol



Centralizer

Abbreviations Used

MSL Mean Sea Level
A/C Asphalt/Concrete
Bent Bentonite
bgs Below Ground Surface
dia Diameter
' Feet
LPH Liquid-Phase Hydrocarbons
PSH Phase Separated Hydrocarbons
GW Groundwater
HC Hydrocarbon
" Inches
med Medium
mod Moderate
NA Not Analyzed
NR Not Recorded
ppm Parts Per Million

Well Design Fill Patterns



Asphalt
Concrete
Concrete Slurry
Bentonite
Bentonite Grout
Sand
Screened Interval

SECOR

INTERNATIONAL INCORPORATED
2655 CAMINO DEL RIO N., SUITE 302
SAN DIEGO, CA. 92108

BOREHOLE/WELL LOG LEGEND

Page 2 of 2

SECOR				BOREHOLE / WELL LOG				Number: MW-1	
Client:		ARCO Products Co.		Job No:		008.60223		Sheet: 1 of 2	
Location:		ARCO Facility # 5350 3804 Plaza Road Oceanside, California		Drilling Company/Driller: Tri-County Drilling / Daniel P. Nichols					
SECOR Rep:		C. Rodriguez		Approved by:					
Date Started:		7/23/01		Date Finished:		7/23/01		Drill Rig/Sampling Method:	
						CME 75/HSA/CA Split Spoon Sampler		Borehole Dia.: 10"	
								Casing Dia.: 4"	
								Surface Elevation: 206.92	
SAMPLE LOG				BOREHOLE LOG				WELL LOG	
Sample Number	OVA/FID (ppm)	Lab Results TPHg(ppm)	Density Blows/ft	Depth in Feet	USCS Symbol	Graphic Log	Geologic Description (Soil Type, Color, grain, minor soil component, moisture, density, odor, etc.)	Well Design	
				0			4" Asphalt		
				1					
				2	SC		Clayey SAND, pale yellow (2.5Y 7/3), very fine-grained sand, moist, dense, no hydrocarbon (HC) odor.		
				3			Becomes yellow (2.5Y 7/6)		
				4					
MW-1/5'	0		7/41/ 50-4"	5			Becomes slightly clayey, no HC odor.		
				6					
				7					
				8					
				9					
MW-1/10'	0		32/30-3"	10	SM		Silty SAND, pale yellow (2.5Y 8/2), very fine grained, moist, very dense, no HC odor.		
				11					
				12					
				13					
MW-1/15'	0		47/53	15			Becomes slightly clayey, no HC odor.		
				16					
				17					
				18					
				19					
MW-1/20'	0		50/5"	20			Becomes very fine-grained, moist, very dense, no HC odor.		
				21					
				22					
				23			Note: Water depth measured after well installation.		
				24					
				25					
MW-1/25'	0		46/50-2"	26	SC		Clayey SAND, pale yellow (2.5Y 8/4), very fine-grained sand, moist, very dense, no HC odor.		
				27					
				28					
				29					
MW-1/30'	0		50/5"	30			Becomes wet.		

SECOR

BOREHOLE / WELL LOG

Number:

MW-1

Client:

ARCO Products Co.

Job No:

008.60223

Sheet:

2 of 2

Location:

ARCO Facility # 5350
3804 Plaza Road
Oceanside, California

Drilling Company/Driller:

Tri-County Drilling /
Daniel P. Nichols

SECOR Rep:

C. Rodriguez

Approved by:

Date Started:

7/23/01

Date Finished:

7/23/01

Drill Rig/Sampling Method:

CME 75/HSA/CA Split Spoon Sampler

Borehole Dia.:

10"

Casing Dia.:

4"

Surface Elevation:

206.92

SAMPLE LOG

BOREHOLE LOG

WELL LOG

Sample Number	OVA/PID (ppm)	Lab Results TPHg(ppm)	Density Blows/ft	Depth in Feet	USCS Symbol	Graphic Log	Geologic Description (Soil Type, Color, grain, minor soil component, moisture, density, odor, etc.)	Well Design
				30				
				1				
				2	SC			
				3				
				4				
				35			Becomes less clayey.	
MW-1/35'	0		50/5"	6			TOTAL DEPTH = 35' BGS	
				7			Stopped drilling at 35', sampled to 35.5'.	
				8			Borehole completed as 4" nominal diameter schedule	
				9			40 PVC monitoring well with 0.02" slotted screen	
				40			from 15' to 35' bgs, #3 Monterey Sand from 12.5' - 35'	
				1			bgs, bentonite chips from 2' - 12.5' bgs and capped	
				2			with concrete and traffic rated well box.	
				3				
				4				
				45				
				6				
				7				
				8				
				9				
				50				
				1				
				2				
				3				
				4				
				55				
				6				
				7				
				8				
				9				
				60				

SECOR

BOREHOLE / WELL LOG

Number:

MW-2

Client:

ARCO Products Co.

Job No:

008.60223

Sheet:

1 of 2

Location:

 ARCO Facility # 5350
3804 Plaza Road
Oceanside, California

Drilling Company/Driller:

 Tri-County Drilling /
Daniel P. Nichols

SECOR Rep:

C. Rodriguez

Approved by:

Date Started:

7/23/01

Date Finished:

7/23/01

Drill Rig/Sampling Method:

CME 75/HSA/CA Split Spoon Sampler

Borehole Dia.:

10"

Casing Dia.:

4"

Surface Elevation:

205.46


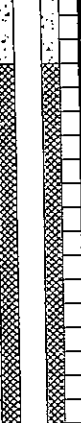

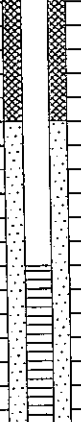

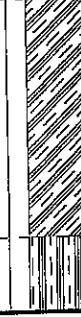



SAMPLE LOG

BOREHOLE LOG

WELL LOG

Sample Number	OVA/PID (ppm)	Lab Results TPHg(ppm)	Density Blows/ft	Depth in Feet	USCS Symbol	Graphic Log	Geologic Description (Soil Type, Color, grain, minor soil component, moisture, density, odor, etc.)	Well Design
				0			3" Asphalt	
				1	SC		Clayey SAND, light yellowish brown (2.5Y 6/3), fine-grained sand, moist, no hydrocarbon (HC) odor.	
				2				
				3				
				4				
				5				
MW-2/5'	0		9/11/22	6	SM		Becomes slightly clayey, silty Sand, pale yellow (2.5Y 7/3), fine-grained, medium dense, moist, no HC odor.	
				7				
				8				
				9				
				10				
MW-2/10'	0		18/32/37	11	SC		Silty SAND, pale yellow (2.5Y 8/2), very fine-grained, moist, dense, slight HC odor.	
				12				
				13				
				14				
				15				
MW-2/15'	0		50/6"	16	SC		Clayey SAND, pale yellow (2.5Y 8/2), very fine-grained, moist, very dense, some HC odor.	
				17				
				18				
				19				
				20				
MW-2/20'	0		35/50-3"	21	SC			
				22				
				23				
				24				
				25				
MW-2/25'	0		53/5.5"	26	SC			
				27				
				28				
				29				
				30				
MW-2/30'	0		50/3"	31	SM		Silty SAND, pale yellow (2.5Y 8/2), fine-grained, moist, very dense, no HC odor.	
				32				
				33				

SECOR				BOREHOLE / WELL LOG				Number: MW-2			
				Client: ARCO Products Co.		Job No: 008.60223		Sheet: 2 of 2			
SECOR Rep: C. Rodriguez		Approved by:		Location: ARCO Facility # 5350 3804 Plaza Road Oceanside, California		Drilling Company/Driller: Tri-County Drilling / Daniel P. Nichols					
Date Started: 7/23/01		Date Finished: 7/23/01		Drill Rig/Sampling Method: CME 75/HSA/CA Split Spoon Sampler		Borehole Dia.: 10"		Casing Dia.: 4"		Surface Elevation: 205.46	
SAMPLE LOG				BOREHOLE LOG							WELL LOG
Sample Number	OVA/PID (ppm)	Lab Results TPHg(ppm)	Density Blows/ft	Depth in Feet	USCS Symbol	Graphic Log	Geologic Description (Soil Type, Color, grain, minor soil component, moisture, density, odor, etc.)				Well Design
				30	SM						
				1							
				2							
				3							
				4							
				35			Becomes very fine-grained.				
MW-2/35'	0		50/5"	6			TOTAL DEPTH = 35' BGS				
				7			<p>Stopped drilling at 35', sampled to 35.5'.</p> <p>Borehole completed as 4" nominal diameter schedule 40 PVC monitoring well with 0.02" slotted screen from 15' to 35' bgs, #3 Monterey Sand from 12' - 35' bgs, bentonite chips from 2' - 12' bgs and capped with concrete and traffic rated well box.</p>				
				8							
				9							
				40							
				1							
				2							
				3							
				4							
				45							
				6							
				7							
				8							
				9							
				50							
				1							
				2							
				3							
				4							
				55							
				6							
				7							
				8							
				9							
				60							

SECOR				BOREHOLE / WELL LOG				Number: MW-3	
				Client: ARCO Products Co.		Job No: 008.60223		Sheet: 1 of 2	
SECOR Rep: C. Rodriguez		Approved by:		Location: ARCO Facility # 5350 3804 Plaza Road Oceanside, California		Drilling Company/Driller: Tri-County Drilling / Daniel P. Nichols			
Date Started: 7/23/01		Date Finished: 7/23/01		Drill Rig/Sampling Method: CME 75/HSA/CA Split Spoon Sampler		Borehole Dia.: 10"		Casing Dia.: 4"	
						Surface Elevation: 205.68			
SAMPLE LOG				BOREHOLE LOG					
Sample Number	OVA/PID (ppm)	Lab Results TPHg(ppm)	Density Blows/ft	Depth in Feet	USCS Symbol	Graphic Log	Geologic Description (Soil Type, Color, grain, minor soil component, moisture, density, odor, etc.)		Well Design
				0			3.5" Asphalt		
				1	SC		Clayey SAND, pale yellow (2.5Y 7/3), fine-grained sand, moist, dense, no hydrocarbon (HC) odor.		
			2						
			3						
			4						
			5						
MW-3/5'	0	7/8/14		6			Becomes slightly Clayey, Silty SAND, pale yellow (2.5Y 8/3), very fine-grained, medium dense, moist.		
				7					
				8					
				9					
MW-3/10'	0	27/30/43		10	SM		Silty SAND, pale yellow (2.5Y 8/4), very fine-grained, moist, dense, no HC odor.		
			11						
			12						
			13						
			14						
MW-3/15'	0	37/54		15			Becomes slightly clayey.		
			16						
			17						
			18						
			19						
MW-3/20'	0	30/55		20					
				21					
				22					
				23					
MW-3/25'	0	45/50-4"		24	SC		Clayey, Silty SAND, pale yellow (2.5Y 8/2), very fine-grained, very moist to wet, very dense, no HC odor.		
			25						
			26						
			27						
			28						
				29					
MW-3/30'	0	35/50-5"		30	SM		Silty SAND, light brownish gray (2.5Y 6/2), very fine-grained, moist, very dense, no HC odor.		
			31						

SECOR				BOREHOLE / WELL LOG				Number: MW-3		
				Client: ARCO Products Co.			Job No: 008.60223		Sheet: 2 of 2	
				Location: ARCO Facility # 5350 3804 Plaza Road Oceanside, California			Drilling Company/Driller: Tri-County Drilling / Daniel P. Nichols			
SECOR Rep: C. Rodriguez		Approved by:		Drill Rig/Sampling Method: CME 75/HSA/CA Split Spoon Sampler			Borehole Dia.: 10"	Casing Dia.: 4"	Surface Elevation: 205.68	
Date Started: 7/23/01		Date Finished: 7/23/01								
SAMPLE LOG				BOREHOLE LOG					WELL LOG	
Sample Number	OVA/PID (ppm)	Lab Results TPHg(ppm)	Density Blows/ft	Depth in Feet	USCS Symbol	Graphic Log	Geologic Description (Soil Type, Color, grain, minor soil component, moisture, density, odor, etc.)		Well Design	
				30	SM		Becomes slightly clayey.			
				1						
				2						
				3						
				4						
MW-3/35'	0		50/5"	35			TOTAL DEPTH = 35' BGS			
				6			<p>Stopped drilling at 35', sampled to 35.5'.</p> <p>Borehole completed as 4" nominal diameter schedule 40 PVC monitoring well with 0.020" slotted screen from 15' to 35' bgs, #3 Monterey Sand from 12' - 35' bgs, bentonite chips from 2' - 12' bgs and capped with concrete and traffic rated well box.</p>			
				7						
				8						
				9						
				40						
				1						
				2						
				3						
				4						
				45						
				6						
				7						
				8						
				9						
				50						
				1						
				2						
				3						
				4						
				55						
				6						
				7						
				8						
				9						
				60						

SECOR

BOREHOLE / WELL LOG

Number:

MW-4

Client:

BP/ Atlantic Richfield Co.

Job No:

08BP.05350.02

Sheet:

1 of 2

Location:

 ARCO Facility # 5350
3804 Plaza Drive
Oceanside, California

Drilling Company/Driller:

 West Hazmat Drilling /
Rick Hastings

SECOR Rep:

M. Wackerman

Approved by:

Date Started:

8/28/02

Date Finished:

8/28/02

Drill Rig/Sampling Method:

CME 75/ CA Split Spoon Sampler

Borehole Dia.:

10"

Casing Dia.:

4"

Surface Elevation:

206.60

WELL LOG

SAMPLE LOG				BOREHOLE LOG				WELL LOG	
Sample Number	OVA/PID (ppm)	Lab Results TPHg(ppm)	Density Blows/ft	Depth in Feet	USCS Symbol	Graphic Log	Geologic Description (Soil Type, Color, grain, minor soil component, moisture, density, odor, etc.)	Well Design	
				0			3" Asphalt		
				1			Fill Material		
				2	SP		Poorly graded SAND, moderate yellowish brown (10YR 4/4), medium grained sand, dry, loose, no hydrocarbon (HC) odor.		
				3					
				4					
				5					
MW-4/6'	20	<10	10/30/37	6	SW		Well graded SAND with Gravel, moderate yellowish brown (10YR 4/4), fine to coarse grained sand, 20-30% gravel, subangular gravel up to 1/4" diameter, dry, medium dense, no HC odor.		
				7					
				8					
				9					
				10			Increase gravel.		
MW-4/11'	20	<10	29/50-3"	11	SM		NOTE: Depth to groundwater measured after well installation. Poorly graded Silty SAND, yellowish gray (5Y 7/2), fine grained, dry, very dense, no HC odor.		
				12					
				13					
				14					
MW-4/16'	20	<10	50-5"	15			Same as above. Some iron staining, occasional gravel lenses.		
				16					
				17					
				18					
				19			Dense.		
				20					
MW-4/21'	40	<10	50-6"	21			Same as above.		
				22					
				23			Very dense.		
				24			Dense.		
				25			Same as above.		
MW-4/26'	120	<10	50-6"	26					
				27					
				28	CL		Silty CLAY, light olive gray (5Y 5/2), 30% silt, dry, very hard, no HC odor.		
				29					
				30			Becomes grayish red purple (5RP 6/2).		

SECOR

BOREHOLE / WELL LOG

Number:

MW-4

Client:

BP/ Atlantic Richfield Co.

Job No:

08BP.05350.02

Sheet:

2 of 2

Location:

ARCO Facility # 5350
3804 Plaza Drive
Oceanside, California

Drilling Company/Driller:

West Hazmat Drilling /
Rick Hastings

SECOR Rep:

M. Wackerman

Approved by:

Date Started:

8/28/02

Date Finished:

8/28/02

Drill Rig/Sampling Method:

CME 75/ CA Split Spoon Sampler

Borehole Dia.:

10"

Casing Dia.:

4"


Surface Elevation:

206.60

SAMPLE LOG

BOREHOLE LOG

WELL LOG

Sample Number	OVA/PID (ppm)	Lab Results TPHg(ppm)	Density Blows/ft	Depth in Feet	USCS Symbol	Graphic Log	Geologic Description (Soil Type, Color, grain, minor soil component, moisture, density, odor, etc.)	Well Design
				30				
				1				
				2				
				3				
				4				
				35				
				6				
				7				
				8				
				9				
				40				
				1				
				2				
				3				
				4				
				45				
				6				
				7				
				8				
				9				
				50				
				1				
				2				
				3				
				4				
				55				
				6				
				7				
				8				
				9				
				60				

TOTAL DEPTH = 31' BGS

Stopped drilling at 31'. Borehole completed as 4" nominal diameter schedule 40 PVC monitoring well with 0.020" slotted screen from 15' to 30' bgs, #3 Monterey Sand from 13' - 31' bgs, bentonite chips from 3' - 13' bgs, and capped with concrete and traffic rated well box.

SECOR

BOREHOLE / WELL LOG

Number:

MW-5

Client: BP/ Atlantic Richfield Co.

Job No: 08BP.05350.02

Sheet:

1 of 2

 Location: ARCO Facility # 5350
3804 Plaza Drive
Oceanside, California

 Drilling Company/Driller:
West Hazmat Drilling /
Rick Hastings

 SECOR Rep:
M. Wackerman

Approved by:

 Date Started:
8/28/02

 Date Finished:
8/28/02

 Drill Rig/Sampling Method:
CME 75/ CA Split Spoon Sampler

 Borehole Dia.:
10"

 Casing Dia.:
4"

 Surface Elevation:
205.10

SAMPLE LOG				BOREHOLE LOG				WELL LOG
Sample Number	OVA/PID (ppm)	Lab Results TPHg(ppm)	Density Blows/ft	Depth in Feet	USCS Symbol	Graphic Log	Geologic Description (Soil Type, Color, grain, minor soil component, moisture, density, odor, etc.)	Well Design
				0			3" Asphalt	
				1			Fill Material	
				2	SP		Poorly graded SAND, yellowish gray (5Y 7/3), medium to fine grained sand, dry, loose, no HC odor.	
				3				
				4				
				5			Same as above, occasional iron staining, very dense.	
MW-5/6'	80	<10	17/50-5"	6				
				7				
				8				
				9				
				10			Same as above, no iron staining.	
MW-5/11'	60	<10	37/50-3"	11				
				12				
				13				
				14				
				15			Same as above.	
MW-5/16'	200	<10	50-6"	16				
				17				
				18				
				19				
				20			NOTE: Depth to water measured after well installation. Same as above, some iron staining.	
MW-5/21'	80	<10	50-6"	21				
				22	SM			
				23				
				24				
				25				
MW-5/26'	40	<10	50-6"	26			Silty SAND, pale olive (10Y 6/2), 20% silt, very dense, no HC odor.	
				27				
				28				
				29				
				30				
							See next page	

SECOR

BOREHOLE / WELL LOG

Number:
MW-5

Client: BP/ Atlantic Richfield Co.

Job No:
08BP.05350.02

Sheet:
2 of 2

Location:
ARCO Facility # 5350
3804 Plaza Drive
Oceanside, California

Drilling Company/Driller:
West Hazmat Drilling /
Rick Hastings

SECOR Rep:
M. Wackerman

Approved by:

Date Started:
8/28/02

Date Finished:
8/28/02

Drill Rig/Sampling Method:
CME 75/ CA Split Spoon Sampler

Borehole Dia.:
10"

Casing Dia.:
4"

Surface Elevation:
205.10

SAMPLE LOG				BOREHOLE LOG				WELL LOG
Sample Number	OVA/PID (ppm)	Lab Results TPHg(ppm)	Density Blows/ft	Depth in Feet	USCS Symbol	Graphic Log	Geologic Description (Soil Type, Color, grain, minor soil component, moisture, density, odor, etc.)	Well Design
MW-5/31'	40	<10	50-3"	30	SP		Poorly graded SAND, very light gray (N8), medium to fine grained sand, damp, very dense, no HC odor.	
				1				
				2				
				3				
				4				
				35				
				6				
				7				
				8				
				9				
				40				
				1				
				2				
				3				
				4				
				45				
				6				
				7				
				8				
				9				
				50				
				1				
				2				
				3				
				4				
				55				
				6				
				7				
				8				
				9				
				60				

TOTAL DEPTH = 31' BGS

Borehole completed as 4" nominal diameter schedule 40 PVC monitoring well with 0.020" slotted screen from 15' to 35' bgs, #3 Monterey Sand from 13' - 31' bgs, bentonite chips from 3' - 13' bgs, and capped with concrete and traffic rated well box.

SECOR

BOREHOLE / WELL LOG

Number: MW-6

Client: BP/ Atlantic Richfield Co.

Job No: 08BP.05350.02

Sheet: 1 of 2

Location: ARCO Facility # 5350
3804 Plaza Drive
Oceanside, California

Drilling Company/Driller:
West Hazmat Drilling /
Rick Hastings

SECOR Rep:
M. Wackerman

Approved by:

Date Started:
8/28/02

Date Finished:
8/28/02

Drill Rig/Sampling Method:
CME 75/ CA Split Spoon Sampler

Borehole Dia.:
10"

Casing Dia.:
4"

Surface Elevation:
204.05

SAMPLE LOG				BOREHOLE LOG				WELL LOG
Sample Number	OVA/PID (ppm)	Lab Results TPHg(ppm)	Density Blows/ft	Depth in Feet	USCS Symbol	Graphic Log	Geologic Description (Soil Type, Color, grain, minor soil component, moisture, density, odor, etc.)	Well Design
				0			3" Asphalt	
				1			Fill Material	
				2				
				3				
				4				
				5			Poorly graded SAND, moderate olive brown (5Y 4/4), coarse to medium grained sand, dry, loose, no HC odor.	
MW-6/6'	160	<10	10/17/23	6			Becomes pale yellowish brown (10YR 6/2), medium to fine grained sand, dry, dense, no HC odor.	
				7				
				8				
				9				
MW-6/11'	120	<10	50-6"	10			Same as above, very dense, occasional iron staining.	
				11				
				12				
				13				
				14				
MW-6/16'	160	<10	50-6"	15			Becomes pale olive (10Y 6/2).	
				16				
				17				
				18				
				19				
MW-6/21'	240	<10	50-6"	20			NOTE: Depth to water measured after monitoring well installation. Same as above.	
				21				
				22				
				23				
				24				
MW-6/26'	260	<10	50-6"	25			Same as above, wet.	
				26				
				27				
				28				
				29				
				30				

See next page

SECOR

BOREHOLE / WELL LOG

Number:

MW-6

Client:

BP/ Atlantic Richfield Co.

Job No:

08BP.05350.02

Sheet:

2 of 2

Location:

 ARCO Facility # 5350
3804 Plaza Drive
Oceanside, California

Drilling Company/Driller:

 West Hazmat Drilling /
Rick Hastings

SECOR Rep:

M. Wackerman

Approved by:

Date Started:

8/28/02

Date Finished:

8/28/02

Drill Rig/Sampling Method:

CME 75/ CA Split Spoon Sampler

Borehole Dia.:

10"

Casing Dia.:

4"



Surface Elevation:

204.05

SAMPLE LOG

BOREHOLE LOG

WELL LOG

Sample Number	OVA/PID (ppm)	Lab Results TPHg(ppm)	Density Blows/ft	Depth in Feet	USCS Symbol	Graphic Log	Geologic Description (Soil Type, Color, grain, minor soil component, moisture, density, odor, etc.)	Well Design
MW-6/31'	220	<10	50-6"	30	SM		Silty SAND, pale olive (10Y 6/2), 25 % silt, moist, very hard, no HC odor.	
				1				
				2				
				3				
				4				
				35				
				6				
				7				
				8				
				9				
				40				
				1				
				2				
				3				
				4				
				45				
				6				
				7				
				8				
				9				
				50				
				1				
				2				
				3				
				4				
				55				
				6				
				7				
				8				
				9				
				60				

TOTAL DEPTH = 31' BGS

Stopped drilling at 31', sampled to 31.5'.
Borehole completed as 4" nominal diameter
schedule 40 PVC monitoring well with 0.020"
slotted screen from 15' to 30' bgs, #3 Monterey
Sand from 13' - 31' bgs, bentonite chips from 3' -
13' bgs, and capped with concrete and traffic
rated well box.



BOREHOLE / WELL LOG

Number: MW-7

Client: Atlantic Richfield Co.

Job No: 08BP.05350.04

Sheet: 1 of 1

Location: ARCO Facility No. 5350
3804 Plaza Drive
Oceanside, CA

Drilling Company/Driller:
West Hazmat Drilling/
Rick Hastings

SECOR Rep:
M. Wackerman

Approved by:
firm

Date Started:
7/7/04

Date Finished:
7/7/04

Drill Rig/Sampling Method:
CME 85 Hollow-Stem Auger / Split Spoon

Borehole Dia.:
10"

Casing Dia.:
4"

Surface Elevation:
NA

SAMPLE LOG				BOREHOLE LOG				WELL LOG
Sample Number	OVA/PID (ppm)	Lab Results TPH(mg/kg)	Density Blows/ft	Depth in Feet	USCS Symbol	Graphic Log	Geologic Description (Soil Type, Color, grain, minor soil component, moisture, density, odor, etc.)	Well Design
				0			3" Asphalt	
				1	AF		Fill Material	
				2	SP		Poorly graded SAND, yellowish brown (10YR 5/6), medium grained sand, some silt, no hydrocarbon (HC) odor.	
				3				
				4				
				5			No HC odor	
MW-7@5'	0.1	<10	30/25/6"	6				
				7				
				8				
				9				
				10	ML		Sandy SILT, olive brown (2.5Y 4/3), some fine grained sand, dry, hard, no HC odor, some white laminations	
MW-7@10'	0.3	<10	38/50/4"	11				
				12				
				13				
				14				
				15	SP		Poorly graded SAND, light brownish gray (2.5Y 6/2), fine grained sand, trace clay, dry, very dense, no HC odor	
MW-7@15'	0.4	<10	38/50/4"	16				
				17				
				18				
				19				
				20			No HC odor	
MW-7@20'	1.2	<10	50/6"	21				
				22				
				23				
				24				
				25			Some iron staining, no HC odor	
MW-7@25'	5.0	<10	50/6"	26				
				27				
				28				
				29				
				30				

TOTAL DEPTH DRILLED = 27' BGS

Terminated boring at 27' bgs. Boring completed as 4-inch diameter schedule 40 PVC monitoring well with 0.020-inch slotted screen from 10 to 25 ft bgs. Annular space was backfilled with #3 Monterey sand from 8 ft to 27 ft bgs, hydrated bentonite chips from 3 ft to 8 ft bgs, and completed with a traffic rated well box set in concrete from grade to 3 ft bgs. Groundwater not encountered.



BOREHOLE / WELL LOG

Number: MW-8

Client: Atlantic Richfield Co.

Job No: 08BP.05350.04

Sheet: 1 of 1

Location: ARCO Facility No. 5350
3804 Plaza Drive
Oceanside, CA

Drilling Company/Driller:
West Hazmat Drilling/
Rick Hastings

SECOR Rep:
M. Wackerman

Approved by: *[Signature]*

Date Started:
7/7/04

Date Finished:
7/7/04

Drill Rig/Sampling Method:
CME 85 Hollow-Stem Auger / Split Spoon

Borehole Dia.:
10"

Casing Dia.:
4"

Surface Elevation:
NA

SAMPLE LOG				BOREHOLE LOG				WELL LOG
Sample Number	OVA/PID (ppm)	Lab Results TPH(mg/kg)	Density Blows/ft	Depth in Feet	USCS Symbol	Graphic Log	Geologic Description (Soil Type, Color, grain, minor soil component, moisture, density, odor, etc.)	Well Design
				0			3" Asphalt	
				1	AF		Fill Material	
				2	SM		Silty SAND, brown (10YR 5/3), fine to medium grained sand, some silt, some clay, trace subangular gravel up to ~2" diameter, dry, dense, no hydrocarbon (HC) odor	
				3				
				4				
				5				
MW-8@5'	1.2	<10	39/34/6"	6	SW		Well Graded SAND, grayish brown (2.5Y 5/2), fine to medium grained sand, slightly moist, dense, no HC odor	
				7				
				8				
				9				
				10	SP		Poorly Graded SAND, pale yellow (2.5Y 7/3), fine to medium grained sand, silt, slightly moist, dense, no HC odor, iron staining	
MW-8@10'	8.6	<10	45/50/3"	11				
				12				
				13				
				14				
				15				
MW-8@15'	24.5	<10	35/50/2"	16			Becomes light gray (10YR 7/1), fine grained sand, some silt, slightly moist, dense, no HC odor, iron staining	
				17				
				18				
				19				
				20				
MW-8@20'	41.0	<10	50/6"	21	SW		Well Graded SAND, light grayish brown (10YR 6/2), fine grained sand, some silt, slightly moist, dense, no HC odor, iron staining, slightly cemented	
				22				
				23				
				24				
				25				
MW-8@25'	58.6	<10	50/6"	26	SM		Silty SAND, light gray (2.5Y 7/1), fine to coarse grained sand, some silt, slightly wet, dense, no HC odor	
				27				
				28				
				29				
				30				

TOTAL DEPTH DRILLED = 27' BGS
Terminated boring at 27' bgs. Boring completed as 4-inch diameter schedule 40 PVC monitoring well with 0.020-inch slotted screen from 10 to 25 ft bgs. Annular space was backfilled with #3 Monterey sand from 8 ft to 27 ft bgs, hydrated bentonite chips from 3 ft to 8 ft bgs, and completed with a traffic rated well box set in concrete from grade to 3 ft bgs. Groundwater not encountered.



BOREHOLE / WELL LOG

Number: MW-9

Client: Atlantic Richfield Co.

Job No: 08BP.05350.04

Sheet: 1 of 1

Location: ARCO Facility No. 5350
3804 Plaza Drive
Oceanside, CA

Drilling Company/Driller:
West Hazmat Drilling/
Rick Hastings

SECOR Rep:
M. Wackerman

Approved by:
KRM

Date Started:
7/7/04

Date Finished:
7/7/04

Drill Rig/Sampling Method:
CME 85 Hollow-Stem Auger / Split Spoon

Borehole Dia.:
10"

Casing Dia.:
4"

Surface Elevation:
NA

SAMPLE LOG

BOREHOLE LOG

WELL LOG

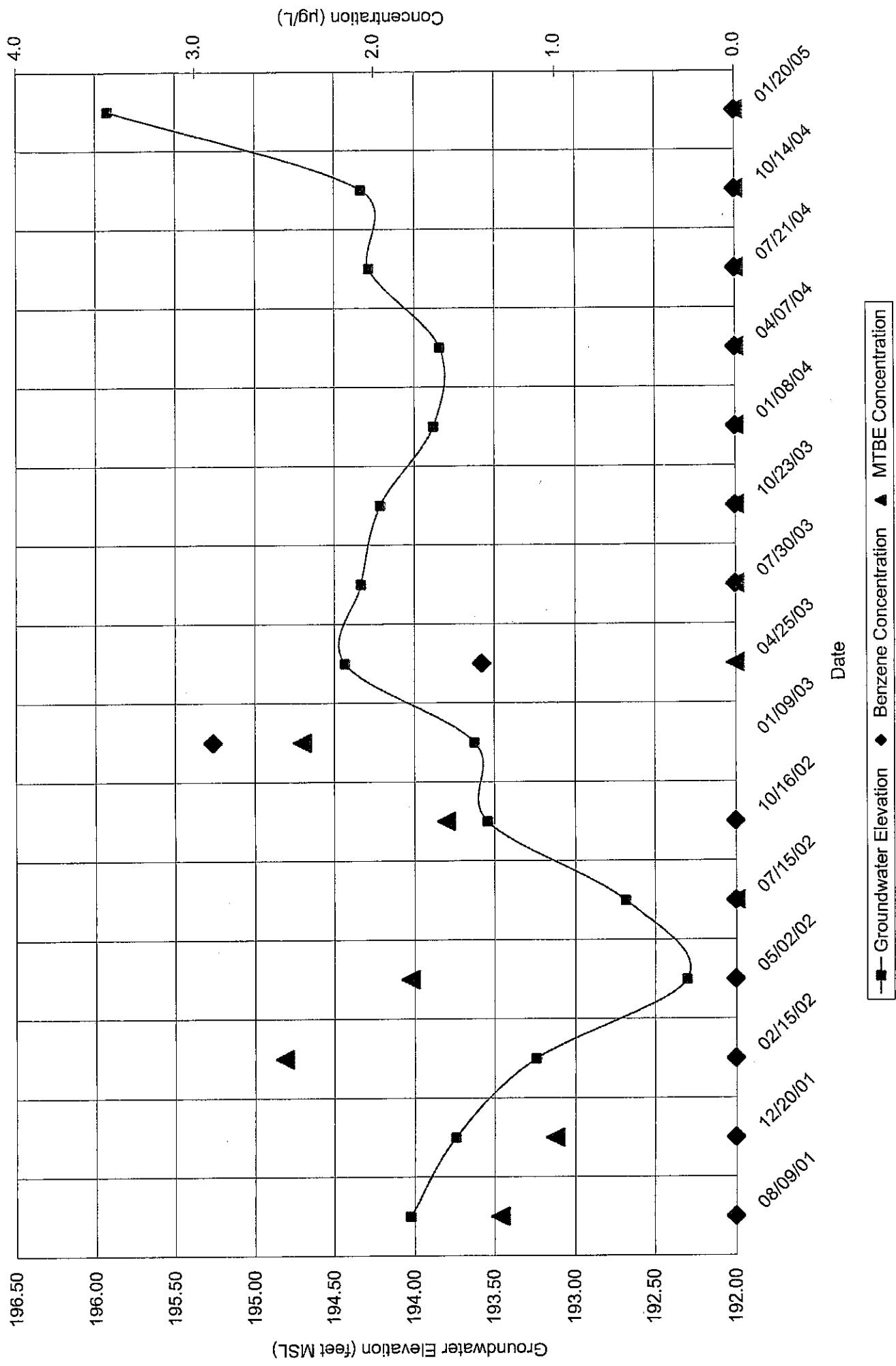
Sample Number	OVA/PID (ppm)	Lab Results TPH(mg/kg)	Density Blows/ft	Depth in Feet	USCS Symbol	Graphic Log	Geologic Description (Soil Type, Color, grain, minor soil component, moisture, density, odor, etc.)	Well Design
				0			3" Asphalt	
				1	AF		Fill Material	
				2	SP		Poorly Graded SAND, light olive brown (2.5Y 5/3), medium grained sand, some silt, some clay, dry, medium dense, no hydrocarbon (HC) odor.	
				3				
				4				
				5			Trace clay, dense, no HC odor	
MW-9@5'	0.1	<10	39/32/6"	6				
				7				
				8				
				9				
				10			Becomes pale yellow (2.5Y 7/3), fine grained sand, weakly cemented, less fines, very dense, no HC odor, some iron staining	
MW-9@10'	0.1	<10	30/50/4"	11				
				12				
				13				
				14				
				15			Becomes light brownish gray (10YR 6/2), no HC odor	
MW-9@15'	0.2	<10	42/50/4"	16				
				17				
				18				
				19				
				20			Becomes damp, heavy iron staining, no HC odor	
MW-9@20'	6.9	<10	50/6"	21				
				22				
				23				
				24				
				25				
MW-9@25'	26.2	<10	50/6"	26				
				27				
				28				
				29				
				30				

TOTAL DEPTH DRILLED = 27' BGS

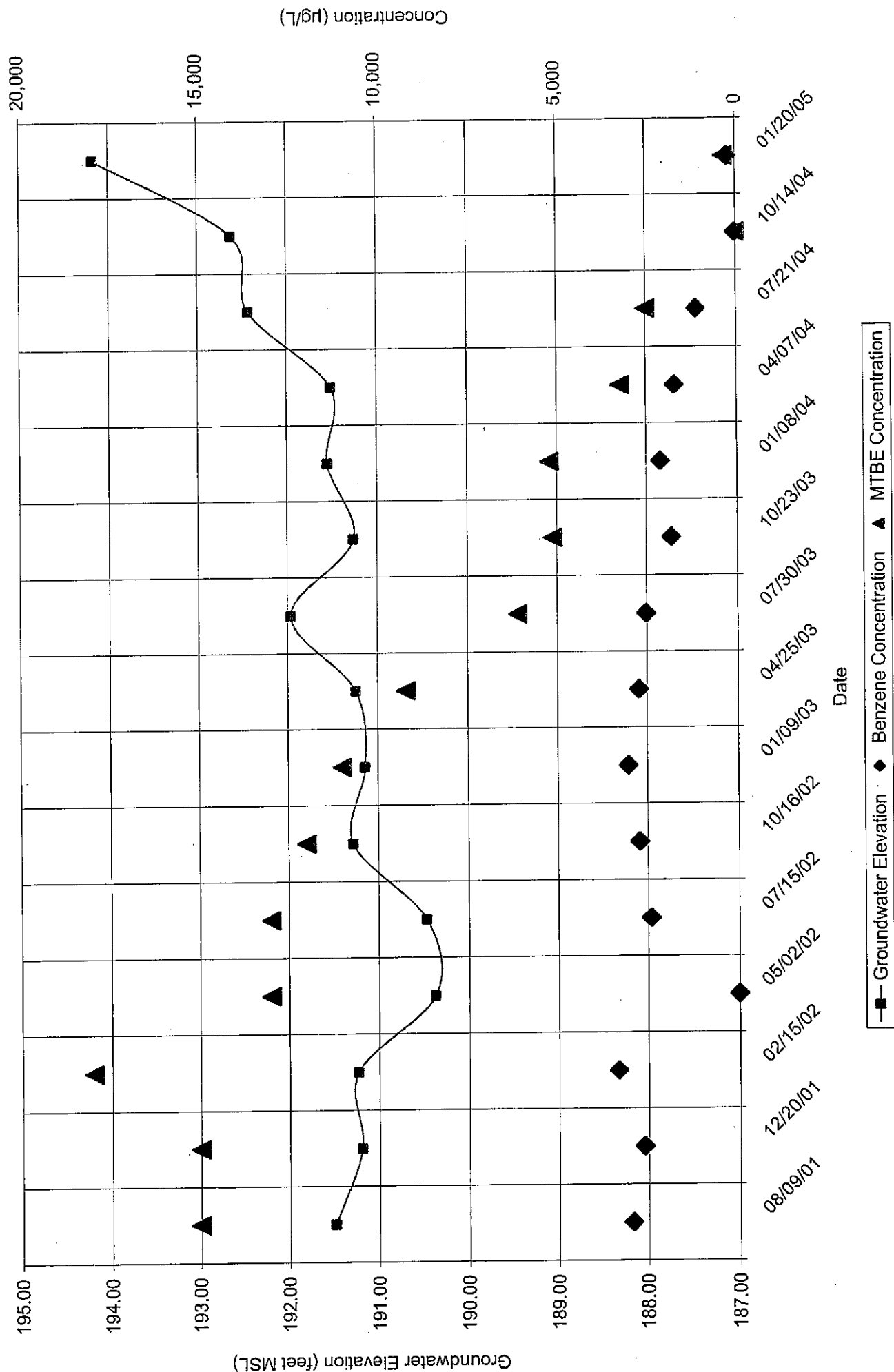
Terminated boring at 27' bgs. Boring completed as 4-inch diameter schedule 40 PVC monitoring well with 0.020-inch slotted screen from 10 to 25 ft bgs. Annular space was backfilled with #3 Monterey sand from 8 ft to 27 ft bgs, hydrated bentonite chips from 3 ft to 8 ft bgs, and completed with a traffic rated well box set in concrete from grade to 3 ft bgs. Groundwater not encountered.

APPENDIX B
WELL HYDROGRAPHS
CORRECTIVE ACTION PLAN
ATLANTIC RICHFIELD COMPANY
ARCO Facility #5350
3804 Plaza Drive
Oceanside, California
Unauthorized Release #H20645-001
SECOR PROJECT NO. 08BP.05350.05
April 21, 2005

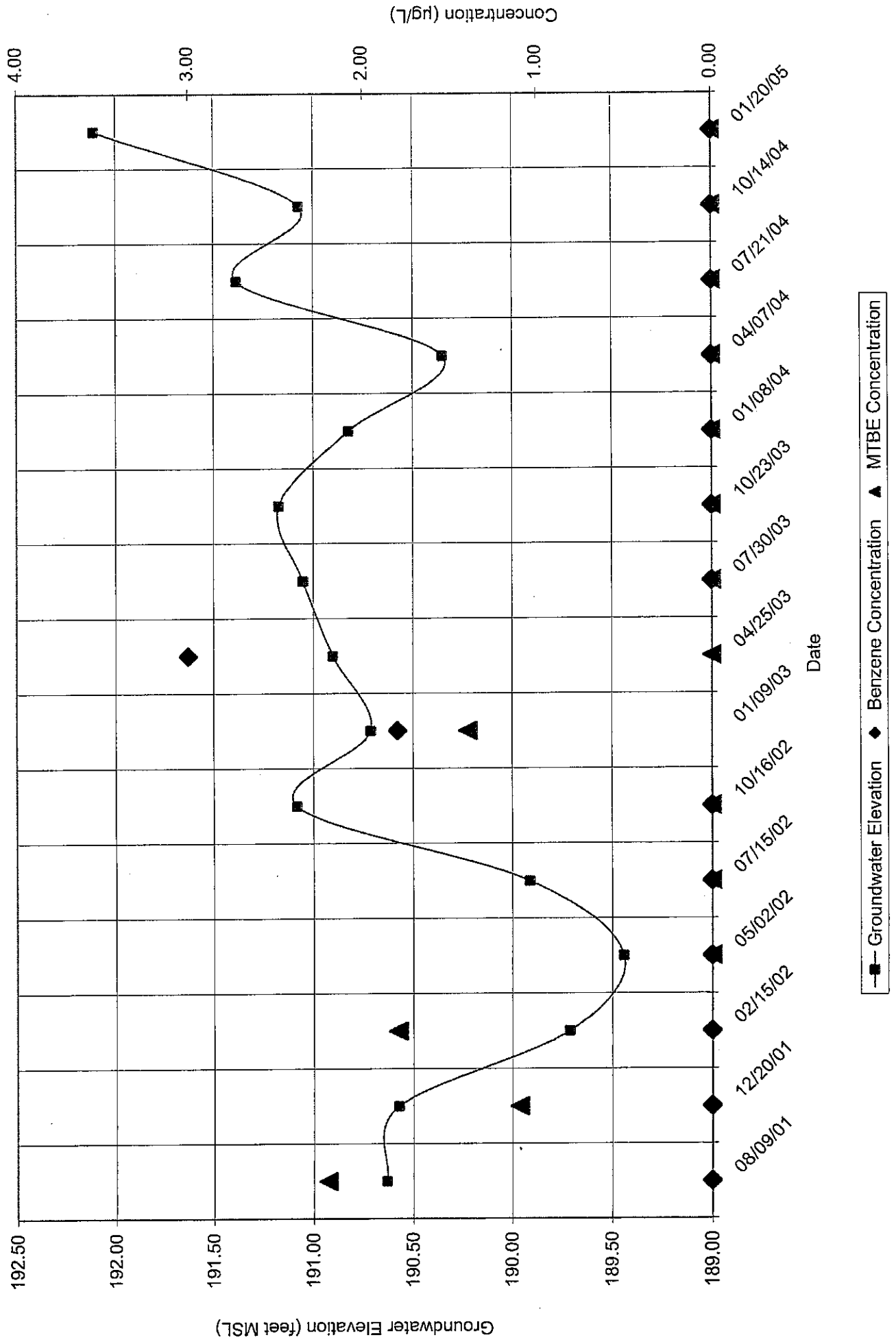
Hydrograph for MW-1



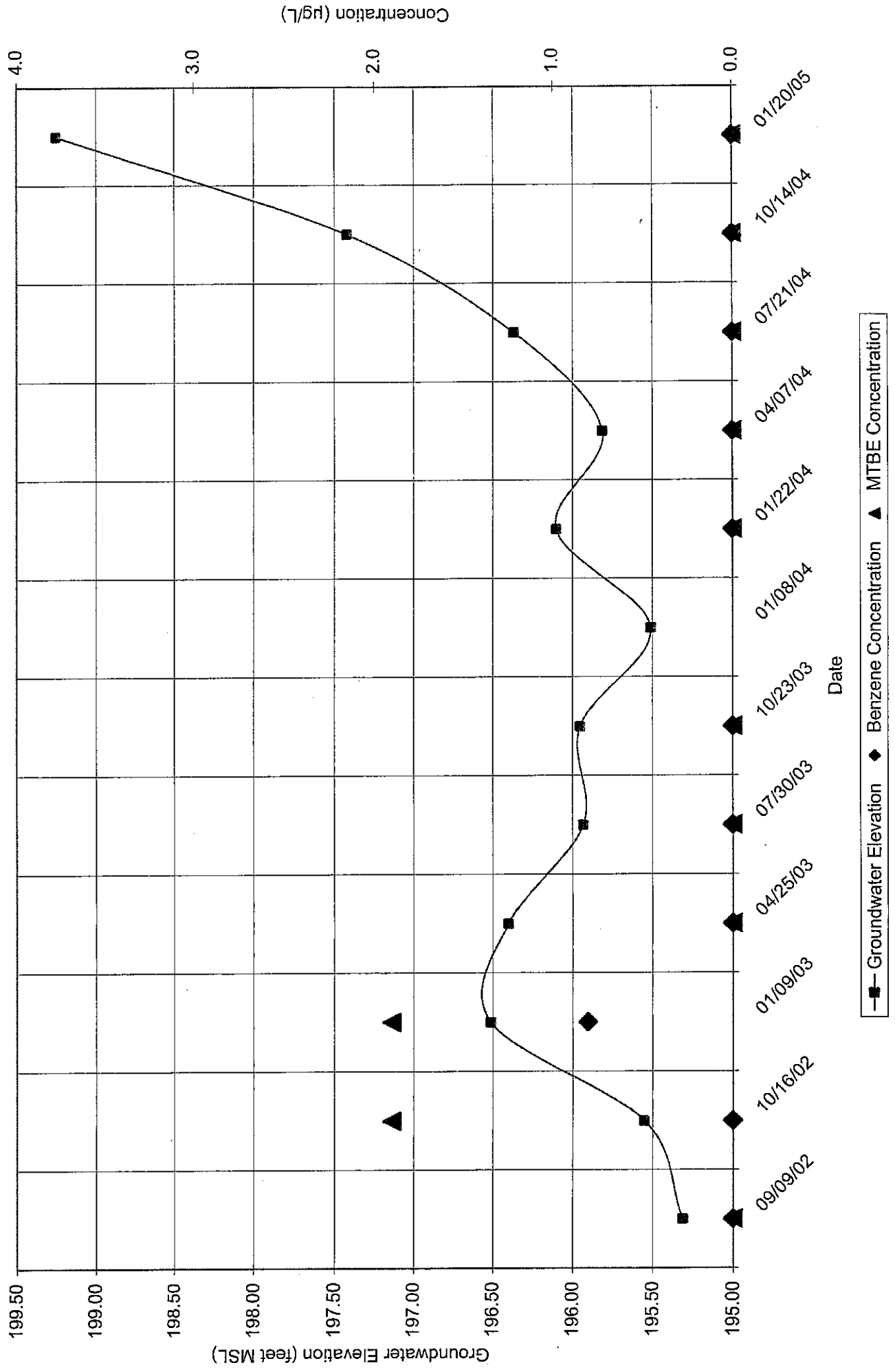
Hydrograph for MW-2



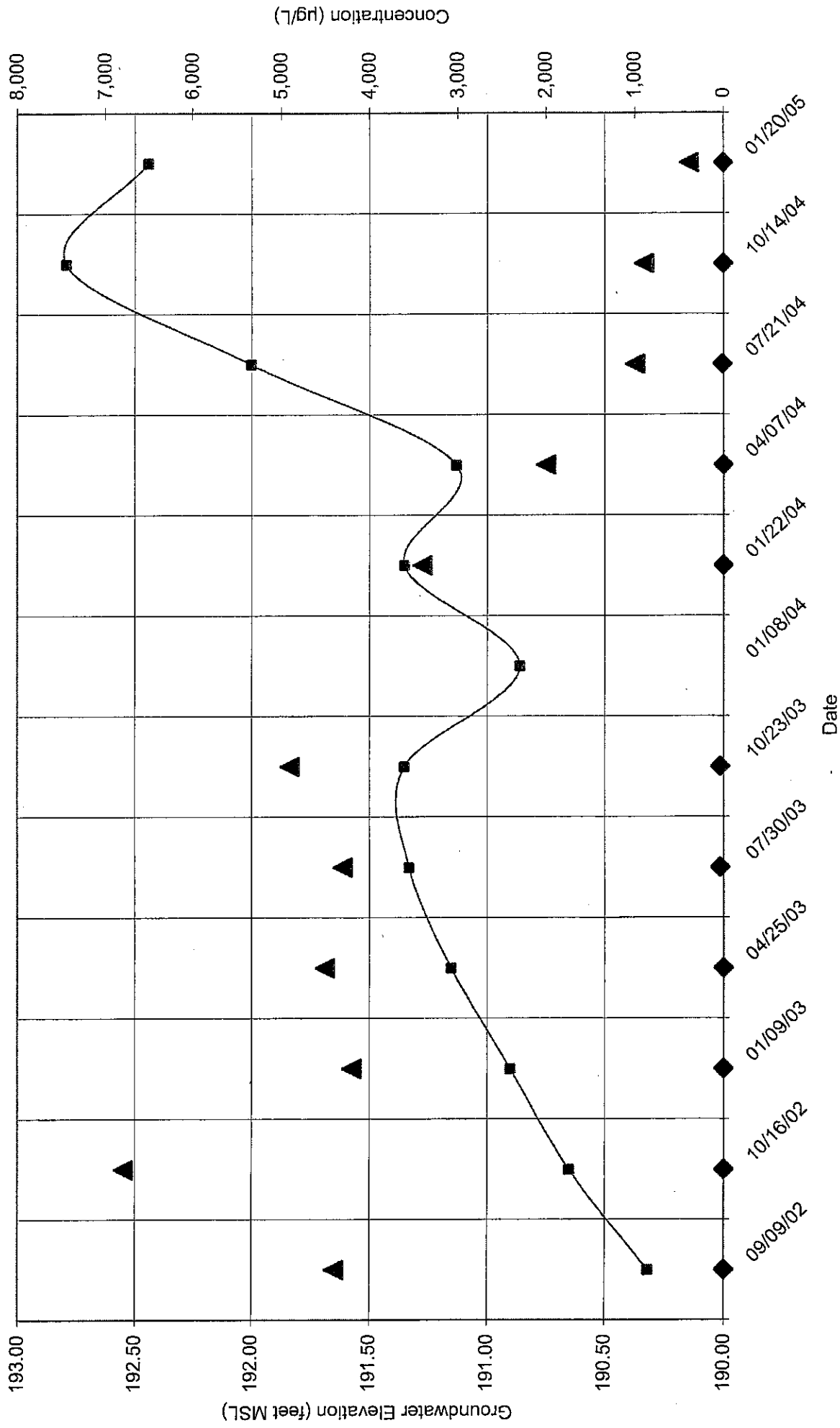
Hydrograph for MW-3



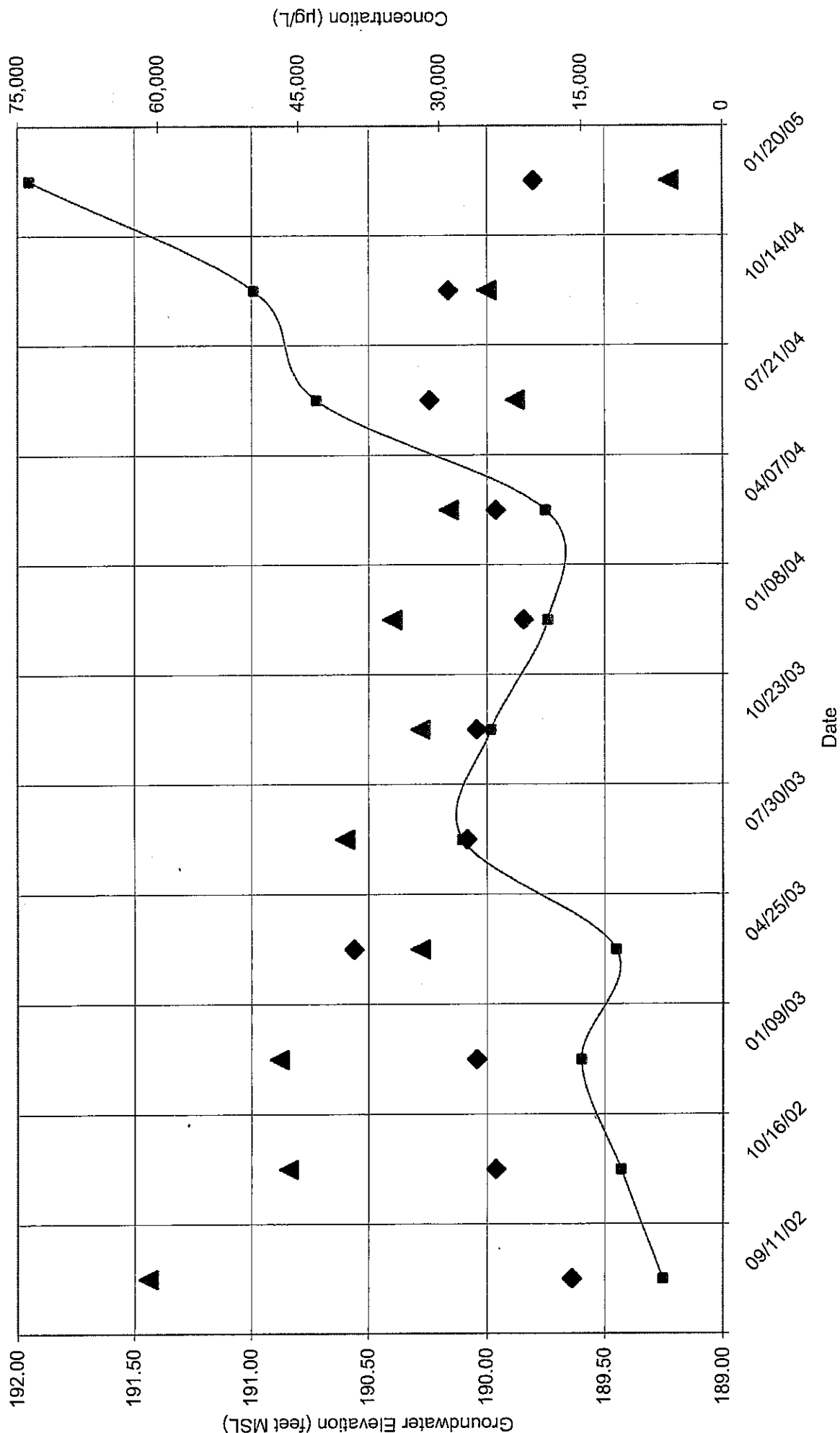
Hydrograph for MW-4



Hydrograph for MW-5

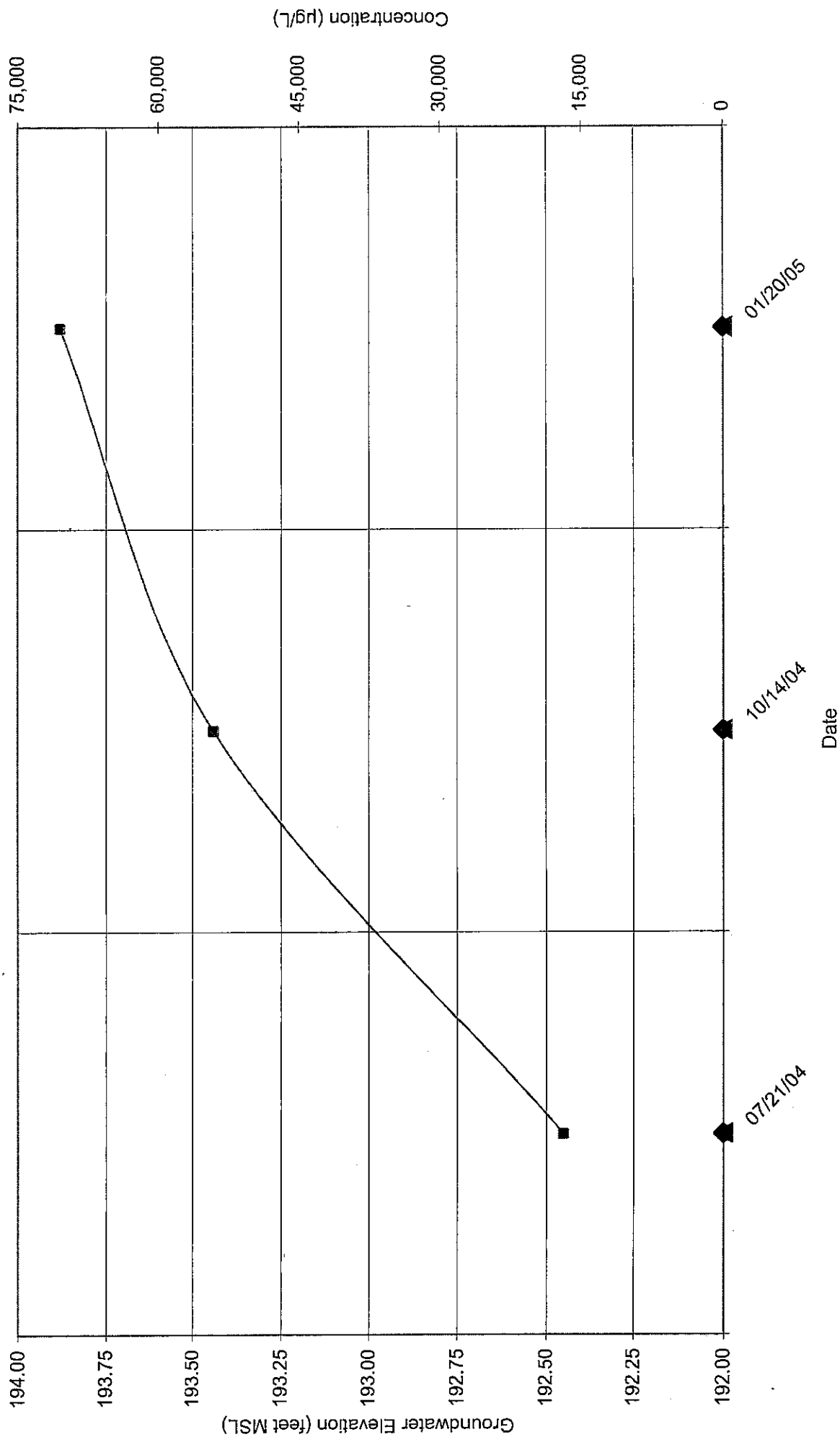


Hydrograph for MW-6

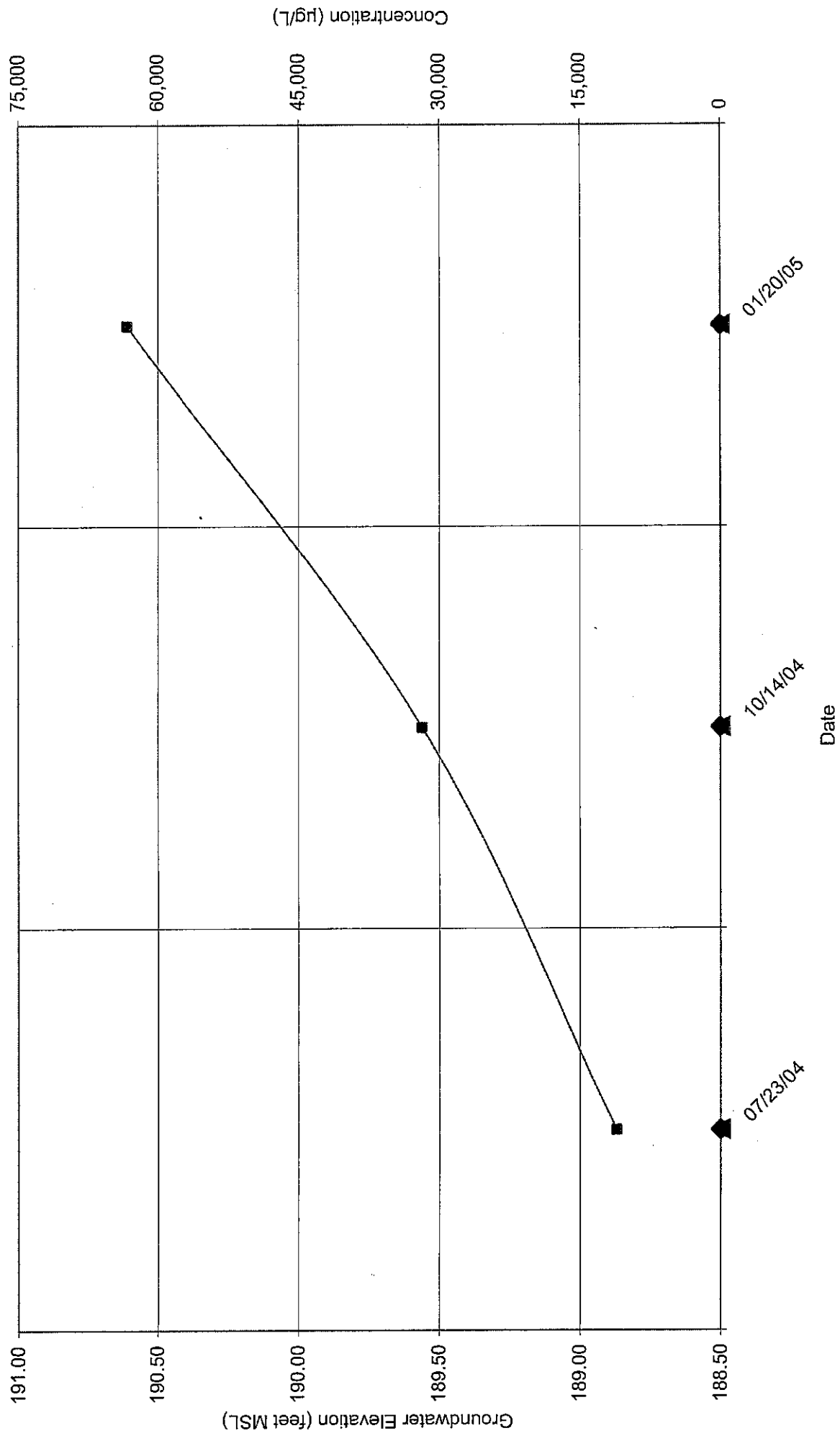


Groundwater Elevation
 Benzene Concentration
 MTBE Concentration

Hydrograph for MW-7

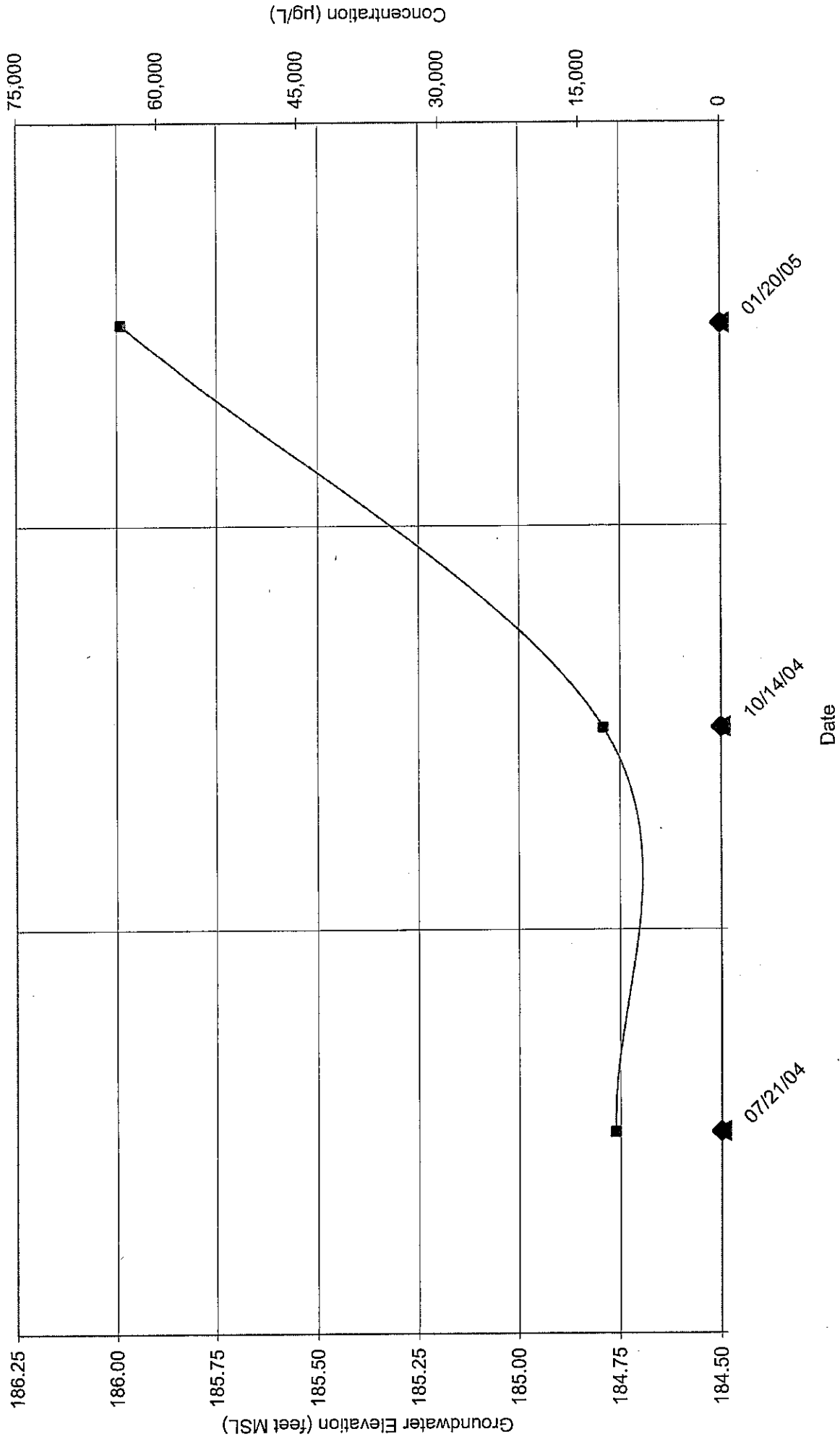


Hydrograph for MW-8



—■— Groundwater Elevation ◆ Benzene Concentration ▲ MTBE Concentration

Hydrograph for MW-9



APPENDIX C
BANKS INFORMATION SOLUTIONS WATER WELL REPORT

CORRECTIVE ACTION PLAN
ATLANTIC RICHFIELD COMPANY

ARCO Facility #5350

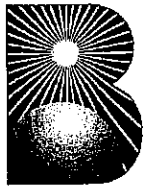
3804 Plaza Drive

Oceanside, California

Unauthorized Release #H20645-001

SECOR PROJECT NO. 08BP.05350.05

April 21, 2005



Banks
Information
Solutions, Inc.

Water Well Report TM

September 3, 2003

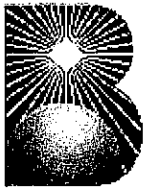
CLIENT

SECOR International, Inc.
2655 Camino Del Rio N., #302
San Diego, CA 92108

SITE

ARCO 5350-H20645-001
3804 Plaza Drive
Oceanside, CA 92056
090303-022

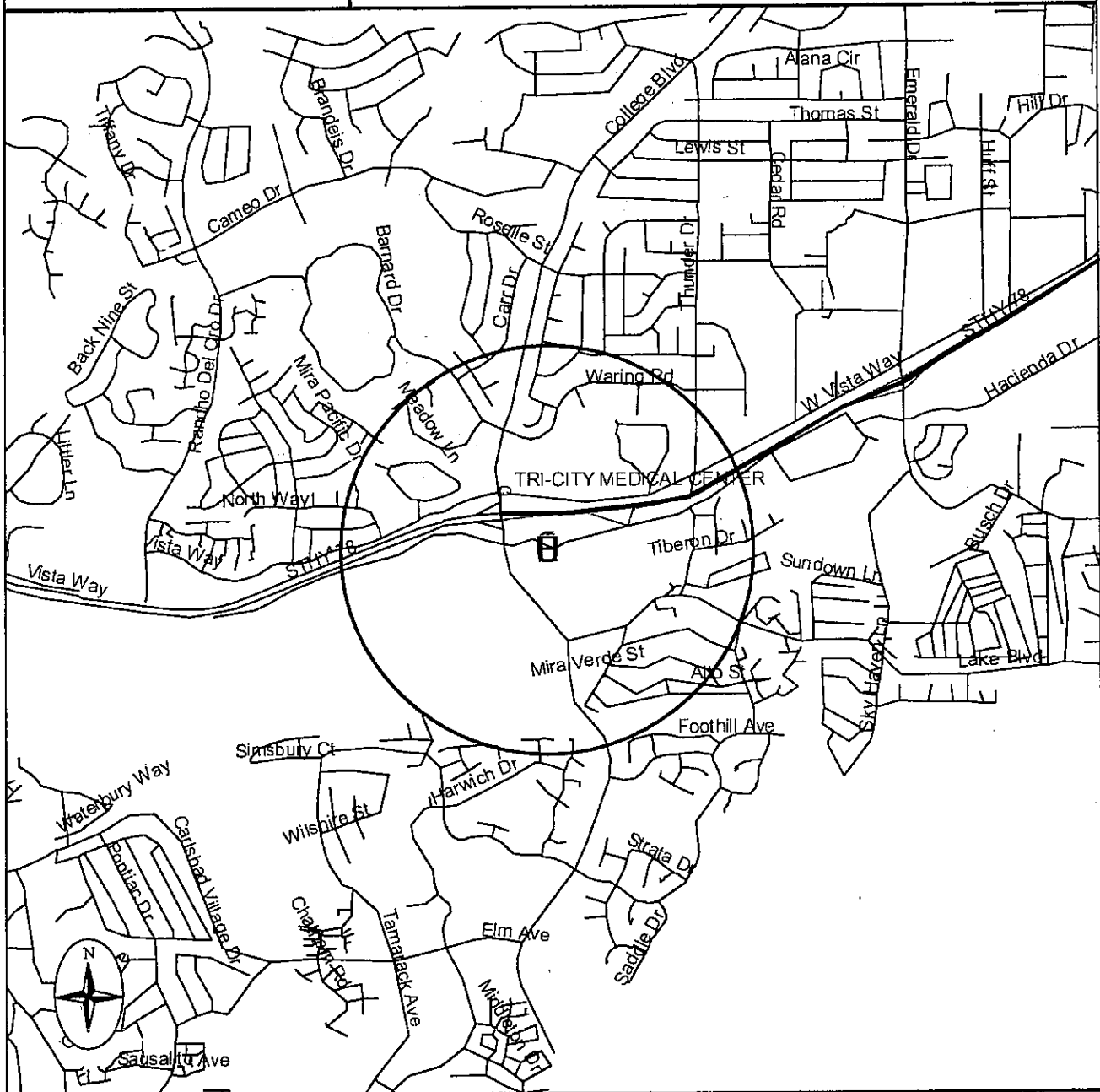
P.O. Box 12851, Capitol Station, Austin, TX 78711
700 N. Lamar, Suite 200 Austin, TX 78703
512.478.0059 FAX 512.478.1433 e-mail banks@banksinfo.com
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**Banks
Information
Solutions, Inc.**

Water Well Report™

Map of Wells within One-Half Mile



Subject Site



Ground Water Wells (Cluster)



Ground Water Well



Airport



Hospital



Highway



Primary road



Secondary and connecting road



Local road



Access road



Water body



Park



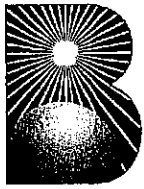
State

0 0.25 0.5 0.75 1 1.25 Miles

Banks Information Solutions, Inc.
P.O. Box 12851, Capitol Station Austin, Texas 78711
700 N. Lamar, Suite 200 Austin, Texas 78703

512-478-0059 FAX 512-478-1433 E Mail: BANKS@BANKSINFO.COM

September 3, 2003



Banks
Information
Solutions, Inc.

Water Well ReportTM

DETAILS

**Banks Information Solutions, Inc.
Performed A Thorough Well
Search And No True Or Active
Water Wells Were Found.**

P.O. Box 12851, Capitol Station, Austin, TX 78711
700 N. Lamar, Suite 200 Austin, TX 78703
512.478.0059 FAX 512.478.1433 e-mail banks@banksinfo.com
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Water Well Report™ Research Mapping Protocol

The Banks Information Solutions, Inc. Water Well Report™ is prepared from existing state water well databases and additional file data/records research conducted at the State of California Department of Water Resources. Submission of water well drillers logs is mandatory under California law. It should be noted that the California water well law applies to all persons constructing, altering, or destroying water wells regardless of whether or not they are engaged in the business of well construction. The law also applies to persons who convert, for use as a water well, an oil or gas well originally constructed under the jurisdiction of the Department of Conservation. More importantly, Banks (as well as any other public entity) is not granted the privilege of viewing, analyzing, or photocopying any filed notice of intent to engage in water well drilling activity or any completion reports, drillers logs, and well schedules. This rule inhibits the public from obtaining crucial data involving owner name, well use, total depth, drill date, etc. The public, in certain instances, can obtain, by law, limited data found on state location maps and groundwater analysis records. Please note the following opinion released on March 30, 1970 from the office of Chief Counsel Porter A. Towner, Department of Water Resources:

"Section 13752 (California Water Code) provides that the information in the logs and reports 'shall not be made available for inspection by the public but shall be made available to governmental agencies for use in making studies, provided that any report shall be made available to any person who obtains a written authorization from the owner of the water well.' When a governmental agency hires you as a consultant, that agency can release the information in the log to you for use in a study, but you would be subject to the same limitations as the public agency. Publication of specific items of information from the well reports, including the well logs, without the consent of the owner(s), is prohibited. You may publish discussions of groundwater conditions in an area described by section, township, and range, even though the conditions were established in whole or in part from studies of well reports. Reference to a specific well must be omitted if the information is derived from the report rather than an independent source. The best way for making the information available without restriction and to use it in a public report is to obtain written releases from the owners of the well."

Banks Information Solutions, Inc. has performed a thorough and diligent search of all groundwater well information provided and recorded with the California Department of Water Resources. All mapped locations are based on information obtained from the Department of Water Resources. Although Banks performs quality assurance and quality control on all research projects, we recognize that any inaccuracies of the records and mapped well locations could possibly be traced to the Department of Water Resources or the actual driller. It may be possible that some water well schedules and logs have never been submitted to the Department of Water Resources, as required by law, and thus may explain the possible unaccountability of privately drilled wells. It is uncertain if the above listing provides 100% of the existing wells within the area of review. Therefore, Banks Information Solutions, Inc. cannot fully guarantee the accuracy of the data or well location(s) of those maps and records maintained by the California Department of Water Resources.

APPENDIX D
FIELD DATA SHEET, LABORATORY ANALYTICAL REPORT,
AND CHAIN-OF-CUSTODY DOCUMENTATION

CORRECTIVE ACTION PLAN
ATLANTIC RICHFIELD COMPANY

ARCO Facility #5350

3804 Plaza Drive

Oceanside, California

Unauthorized Release #H20645-001

SECOR PROJECT NO. 08BP.05350.05

April 21, 2005

REMEDATION BY NATURAL ATTENUATION MONITORING FIELD DATA SHEET

ARCO Facility #5350
3804 Plaza Dr., Oceanside, CA

Date: 1/20/05

Collected by: M. Wackerman

Well Identification	Time	DTW (feet)	Horiba U-22 Water Quality Data					RNA Lab Sample?*
			DO	ORP	S Cond	pH	Temp	
			(mg/L)	(mV)	(S/m)		(°C)	
MW-1	1348	11.88	6.78	190	0.99	6.98	24.2	Yes
MW-2	1255	13.25	6.66	33	0.589	7.12	25.5	Yes
MW-3	1418	14.93	6.78	128	0.900	7.03	24.7	Yes
MW-4	1430	8.89	6.37	130	0.932	6.86	23.1	Yes
MW-5	1323	14.93	3.16	-7.7	0.491	24.9	27.8	Yes
MW-6	1448	13.37	3.97	19	0.604	7.08	24.6	Yes
MW-7	1414	9.94	7.10	140	0.329	7.20	24.2	Yes
MW-8	1315	13.52	4.15	140	0.370	7.19	24.3	Yes
MW-9	1404	17.20	6.55	165	7.21	7.10	24.6	Yes

FE2T

0.0

0.6

0.0

0.0

0.0

0.25

0.0

0.0

0.0

0.645

Notes:

DO = Dissolved oxygen
DTW = Depth to water
mg/L = Milligrams per Liter
mV = Millivolts

ORP = Oxidation-reduction potential
S Cond = Specific conductivity
S/m = Siemens per meter
Temp = Temperature
°C = Degrees celcius

* - RNA Lab Sample Analyses, Bottles, and Preservation for each well (Indicate Standard TAT on CoC):

Analyses, Bottles, and Preservation for each well (Indicate Standard TAT on CoC):

Analysis	Method	Bottle(s)	Preservative
Ferrous Iron	EPA 6010B-Diss	(1) 250 AGB	2% HCL
Sulfate	EPA 300.0	(1) 250 mL Poly	Ice only
Nitrate	EPA 6010B	(1) 500 mL Poly	HNO3
Total Iron	RSK-175 MOD	(3) 40 mL VOAs	HCl

**One well will have 2 QC VOAs in addition to the standard 3 VOAs for TPHg, BTEX, and Methane analysis (5 VOAs for each analysis).



STL Los Angeles
1721 South Grand Avenue
Santa Ana, CA 92705

Tel: 714 258 8610 Fax: 714 258 0921
www.stl-inc.com

February 10, 2005

STL LOT NUMBER: E5A210247
PO/CONTRACT: GEM-6-21909

KURT MYERS
SECOR International Inc
2655 Camino Del Rio North
Suite 302
San Diego, CA 92108-1633

Dear KURT MYERS,

This report contains the analytical results for the 11 samples received under chain of custody by STL Los Angeles on January 21, 2005. These samples are associated with your ARCO #5350 project.

STL Los Angeles certifies that the test results provided in this report meet all the requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in the case narrative. The case narrative is an integral part of the report. NELAP Certification Number for STL Los Angeles is 01118CA/E87652.

Any matrix related anomaly is footnoted within the report. A cooler receipt temperature between 2-6 degrees Celsius is within EPA acceptance criteria. The temperature(s) of the coolers received for this project can be found on the Project Receipt Checklist.

This report shall not be reproduced except in full, without the written approval of the laboratory.

000071

This report contains _____ pages.



CASE NARRATIVE

Historical control limits for the LCS are used to define the estimate of uncertainty for a method.

All applicable quality control procedures met method-specified acceptance criteria.

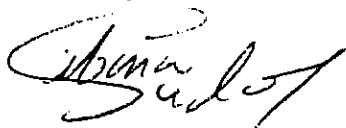
Please note that the trip blank and the equipment blank were included in the cooler for this project, but they were not indicated on the chain of custody (COC). Secor personnel are aware of this situation and the trip blank and the equipment blank were placed on Hold.

Please note that the ferrous iron result is bias high for samples -002 and -006, and should not be used as a basis for decision making in the field. The lab believes the bias high result is most likely due to the sample remaining in an acidic environment beyond the time frame recommended by Standard Methods 3500D.

As defined, Ferrous Iron samples should be analyzed in the field. As this often is not practical, the samples should be collected in unpreserved containers and preserved by the lab prior to analysis. In this case, the lab provided prepreserved containers to you for us in collecting samples for this analysis. This led to the samples being maintained in an acidic state thus converting Ferric Iron to its Ferrous state.

If you have any questions, please feel free to call me at 714.258.8610.

Sincerely,



Sabina Sudoko
Project Manager
CC: Project File





Chain of Custody Record

Project Name:

ARCO 5350 RNA Sampling

BP BU/AR Region/Enfos Segment:

Retail

State or Lead Regulatory Agency:

County of San Diego, DEH

Requested Due Date (mm/dd/yy):

Standard TAT

On-site Time:

Temp:

Off-site Time:

Temp:

Sky Conditions:

Temp:

Meteorological Events:

Temp:

Wind Speed:

Direction:

Lab Name:		STL Los Angeles		BP/AR Facility No.: 5350		Consultant/Contractor: SECOR	
Address:		1721 Grand Ave.		BP/AR Facility Address: 3804 Plaza Dr., Oceanside, CA		Address: 2655 Camino Del Rio North, Suite 302	
		Santa Ana, CA 92705-4808		Site Lat/Long:		San Diego, CA 92108	
Lab PM:		Sabina Sudoko		California Global ID No.: T0607391302		Consultant/Contractor Project No.: 08BP.05350.05	
Tele/Fax:		714.258.8610		Enfos Project No.: GOBNM-001		Consultant/Contractor PM: Kurt Myers	
BP/AR PM Contact:		Roy Thun		Provision or RCOP: Provision		Tele/Fax: 619.296.6195/6199	
Address:		4 Centerpointe Dr.		Phase/WBS: RAP (02)		Report Type & QC Level: Normal	
		La Palma, Ca 90623		Sub Phase/Task: Analytical		E-mail EDD To: kmyers@secor.com	
Tele/Fax:		661.287.3855/222-2349		Cost Element: Subcontracted Cost		Invoice to: Atlantic Richfield Co.	
Lab Bottle Order No:		Matrix		Laboratory No.		Requested Analysis	
Item No.		Date		Time		Sample Point Lat/Long and Comments	
1		12/10/05		1340		MW-1	
2		12/10/05		1230		MW-2	
3		12/10/05		1410		MW-3	
4		12/10/05		1430		MW-4	
5		12/10/05		1353		MW-5	
6		12/10/05		1448		MW-6	
7		12/10/05		1411		MW-7	
8		12/10/05		1345		MW-8	
9		12/10/05		1401		MW-9	
10							
Sampler's Name: MARY MALKERMAN		Relinquished By / Affiliation		Date		Accepted By / Affiliation	
Sampler's Company: SECOR		Date		Time		Date	
Shipment Date: 12/10/05		Date		Time		Date	
Shipment Method: FedEx		Date		Time		Date	
Shipment Tracking No: 8482 4454010		Date		Time		Date	
Special Instructions:		Date		Time		Date	
Custody Seals In Place Yes No		Temp Blank Yes No		Cooler Temperature on Receipt °F/C		Trip Blank Yes No	
Distribution: White Copy - Laboratory / Yellow Copy - BP/Atlantic Richfield Co. / Pink Copy - Consultant/Contractor		BP COC Rev. 4 10/1/04					

Sudoko, Sabina

From: Mary Wackerman [mwackerman@secor.com]
Sent: Friday, January 21, 2005 8:25 AM
To: Sudoko, Sabina
Subject: ARCO 5350 Groundwater Samples

Hi Sabina,

As discussed in our telephone conversation, the trip blanks (Sample ID TB-5350-20050120) and equipment blanks (Sample ID EB-5350-20050120) for the 8015 GRO analysis and the 8260 BTEX and Oxys analysis are included in the sample cooler that is arriving at the lab today, however they were not logged onto the chain of custody. Please add them to the chain of custody and place them on hold. If you have any questions, please give me a call. Thanks.

.....><(((0>...*

Mary A. Wackerman
Staff Scientist
SECOR International Inc.
2655 Camino Del Rio North, Suite 302
San Diego, CA 92108
Phone: 619.296.6195
FAX: 619.296.6199
Cell: 619.347.7343

STL LOS ANGELES - PROJECT RECEIPT CHECKLIST Date: 01/21/05

LIMS Lot #: 55A210247 *cooler* Quote #: _____
 Client Name: SCOR Project: 5350
 Received by: AK Date/Time Received: 01/21/05 @ 1030
 Delivered by: ☐ Client ☐ STL ☐ DHL ☒ Fed Ex ☐ UPS ☐ Other _____

***** Initial / Date 1/20/05

Custody Seal Status Cooler: ☒ Intact ☐ Broken ☐ None
 Custody Seal Status Samples: ☐ Intact ☐ Broken ☒ None
 Custody Seal #(s): _____ ☒ No Seal #.....
 Sampler Signature on COC ☐ Yes ☐ No ☒ N/A...
 IR Gun # A Correction Factor 0.2°C IR passed daily verification ☒ Yes ☐ No
 Temperature - BLANK 59 °C $\pm 0.2^{\circ}\text{C}$ = 57 °C
 Temperature - COOLER (_____ °C _____ °C _____ °C _____ °C) = _____ avg °C \pm _____ CF = _____ °C
 Samples outside temperature criteria but received within 6 hours of final sampling ☐ Yes ☒ N/A...
 Sample Container(s): ☐ STL-LA ☒ Client
 One COC/Multiple coolers: ☐ Yes - # coolers _____ All within temp criteria ☐ Yes ☐ No ☒ N/A...
 One or more coolers with an anomaly: ☐ Yes - (fill out PRC for each) ☒ N/A...
 Samples: ☒ Intact ☐ Broken ☐ Other
 pH measured: ☒ Yes ☐ Anomaly (if checked, notify lab and file NCM) ☐ N/A...
 Anomalies: ☒ Yes - complete CUR and Create NCM NCM # _____
 Complete shipment received in good condition with correct temperatures, containers, labels, volumes preservatives and within method specified holding times. ☒ Yes ☒ N/A...
 Labeled by: AK Labeling checked AK

Turn Around Time: ☐ RUSH-24HR ☐ RUSH-48HR ☐ RUSH-72HR ☒ NORMAL
 Short-Hold Notification: ☐ pH ☐ Wet Chem ☐ Metals (Filter/Pres) ☐ Encore ☐ >1/2 HT expired...
 Outside Analysis(es) (Test/Lab/Date Sent Out): _____

***** LEAVE NO BLANK SPACES ; USE N/A *****

Headspace Anomaly <u>N/A</u> <u>1/20/05</u>					
Lab ID	Container(s) #	Headspace	Lab ID	Container(s) #	Headspace
		<input type="checkbox"/> > 6mm			<input type="checkbox"/> > 6mm
		<input type="checkbox"/> > 6mm			<input type="checkbox"/> > 6mm
		<input type="checkbox"/> > 6mm			<input type="checkbox"/> > 6mm
		<input type="checkbox"/> > 6mm			<input type="checkbox"/> > 6mm
		<input type="checkbox"/> > 6mm			<input type="checkbox"/> > 6mm
		<input type="checkbox"/> > 6mm			<input type="checkbox"/> > 6mm
		<input type="checkbox"/> > 6mm			<input type="checkbox"/> > 6mm
		<input type="checkbox"/> > 6mm			<input type="checkbox"/> > 6mm

[illegible]

* VOA with headspace/bubbles < 6mm

H: HCL, S: H2SO4, N: HNO3, V: VOA, SL, Sleeve, E: Encore, PB: Poly Bottle, CGB: Clear Glass Bottle, AGJ: Amber Glass Jar, T: Terracore
AGB: Amber Glass Bottle, n/?l:HNO3-Lab filtered, n/f:HNO3-Field filtered, znna: Zinc Acetate/Sodium Hydroxide, Na2s2o3: sodium thiosulfate

Condition Upon Receipt Anomaly Form		<input type="checkbox"/> N/A
<div> <div> <div>COOLERS</div> <div> <input type="checkbox"/> Not Received (received COC only) <input type="checkbox"/> Leaking <input type="checkbox"/> Other: </div> </div> <div> <div>TEMPERATURE (SPECS $4 \pm 2^{\circ}\text{C}$)</div> <div> <input type="checkbox"/> Cooler Temp(s) <input type="checkbox"/> Temperature Blank(s) </div> </div> <div> <div>CONTAINERS</div> <div> <input type="checkbox"/> Leaking <input type="checkbox"/> Von Vials with Bubbles > 6mm <input type="checkbox"/> Broken <input checked="" type="checkbox"/> Extra <input type="checkbox"/> Without Labels <input type="checkbox"/> Other: </div> </div> <div> <div>SAMPLES</div> <div> <input type="checkbox"/> Samples NOT RECEIVED but listed on COC <input type="checkbox"/> Samples received but NOT LISTED on COC <input type="checkbox"/> Logged based on Label Information <input type="checkbox"/> Logged based on info from other samples on COC <input type="checkbox"/> Logged according to Work Plan <input type="checkbox"/> Logged on HOLD UNTIL FURTHER NOTICE </div> </div> </div>	<div> <div> <div>CUSTODY SEALS (COOLER(S) CONTAINER(S))</div> <div> <input type="checkbox"/> None <input type="checkbox"/> Not Intact <input type="checkbox"/> Other </div> </div> <div> <div>CHAIN OF CUSTODY (COC)</div> <div> <input type="checkbox"/> Not relinquished by Client; No date/time relinquished <input type="checkbox"/> Incomplete information provided <input type="checkbox"/> Other <input type="checkbox"/> COC not received - notify PM </div> </div> <div> <div>LABELS</div> <div> <input type="checkbox"/> Not the same ID/info as in COC <input type="checkbox"/> Incomplete Information <input type="checkbox"/> Markings/Info illegible <input type="checkbox"/> Torn <input type="checkbox"/> Will be noted on COC—Client to send samples with new COC <input type="checkbox"/> Mislabelled as to tests, preservatives, etc. <input type="checkbox"/> Holding time expired - list sample ID and test <input type="checkbox"/> Improper container used <input type="checkbox"/> Not preserved/Improper preservative used <input type="checkbox"/> Improper pH _____ Lab to preserve sample and document <input type="checkbox"/> Insufficient quantities for analysis <input type="checkbox"/> Other </div> </div> </div>	
<div> <div>Comments:</div> <div> <div>6 Vials of TB not listed on COC</div> </div> </div>		
<div> <div> <div> <div>Corrective Action Implemented:</div> <div> <input type="checkbox"/> Client Informed: verbally on _____ <input type="checkbox"/> Sample(s) on hold until: _____ </div> </div> <div> <div>By: _____</div> <div> <input type="checkbox"/> In writing on _____ <input type="checkbox"/> Sample(s) processed "as is," </div> </div> <div> <div>By: _____</div> </div> </div> </div>		
<div> <div> <div> <div>Logged by/Date:</div> <div> <div>1/26 01/27/05</div> </div> </div> <div> <div>PM Review/Date:</div> <div> <div>1/24</div> <div>52</div> </div> </div> </div> </div>		

STL LOS ANGELES - PROJECT RECEIPT CHECKLIST Date: 01/21/05LIMS Lot #: ESA-210247

Quote #: _____

Client Name: SECOR

Project: _____

Received by: ABDate/Time Received: 1/21/05 @ 1030Delivered by: ☐ Client ☐ STL ☐ DHL ☒ Fed Ex ☐ UPS ☐ Other _____Custody Seal Status Cooler: ☒ Intact ☐ Broken ☐ None Initial / Date Pro 1/21/05Custody Seal Status Samples: ☐ Intact ☐ Broken ☒ None 01/21/05 APZCustody Seal #(s): _____ ☒ No Seal #..... Pro 1/21/05Sampler Signature on COC ☐ Yes ☐ No ☒ N/A...IR Gun # 1 Correction Factor _____ °C IR passed daily verification ☒ Yes ☐ NoTemperature - BLANK 5.9 °C +/- 0.2 CF = 5.7 °C

Temperature - COOLER (____ °C ____ °C ____ °C ____ °C) = ____ avg °C +/- ____ CF = ____ °C

Samples outside temperature criteria but received within 6 hours of final sampling ☐ Yes ☒ N/A...Sample Container(s): ☒ STL-LA ☒ ClientOne COC/Multiple coolers: ☒ Yes - # coolers 2 All within temp criteria ☐ Yes ☐ No ☒ N/A...One or more coolers with an anomaly: ☐ Yes - (fill out PRC for each) ☒ N/A...Samples: ☒ Intact ☐ Broken ☐ OtherpH measured: ☐ Yes ☐ Anomaly (if checked, notify lab and file NCM) ☒ N/A...Anomalies: ☐ No ☒ Yes - complete CUR and Create NCM NCM # _____Complete shipment received in good condition with correct temperatures, containers, labels, volumes preservatives and within method specified holding times. ☐ Yes ☒ N/A...Labeled by: AB Labeling checked: ABTurn Around Time: ☐ RUSH-24HR ☐ RUSH-48HR ☐ RUSH-72HR ☒ NORMALShort-Hold Notification: ☐ pH ☐ Wet Chem ☐ Metals (Filter/Pres) ☐ EnCore ☐ >1/2 HT expired...

Outside Analysis(es) (Test/Lab/Date Sent Out):

***** LEAVE NO BLANK SPACES ; USE N/A *****

Headspace Anomaly					
Lab ID	Container(s) #	Headspace	Lab ID	Container(s) #	Headspace
		<input type="checkbox"/> > 6mm			<input type="checkbox"/> > 6mm
		<input type="checkbox"/> > 6mm			<input type="checkbox"/> > 6mm
		<input type="checkbox"/> > 6mm			<input type="checkbox"/> > 6mm
		<input type="checkbox"/> > 6mm			<input type="checkbox"/> > 6mm
		<input type="checkbox"/> > 6mm			<input type="checkbox"/> > 6mm
		<input type="checkbox"/> > 6mm			<input type="checkbox"/> > 6mm
		<input type="checkbox"/> > 6mm			<input type="checkbox"/> > 6mm
		<input type="checkbox"/> > 6mm			<input type="checkbox"/> > 6mm

[illegible]

* VOA with headspace/bubbles < 6mm

* VOA with headspace/bubbles < 6mm
H: HCL, S: H2SO4, N: HNO3, V: VOA, SL, Sleeve, E: Encore, PB: Poly Bottle, CGB: Clear Glass Bottle, AGJ: Amber Glass Jar, T: Terracore
AGB: Amber Glass Bottle, n/f: HNO3-Lab filtered, n/f: HNO3-Field filtered, zna: Zinc Acetate/Sodium Hydroxide, Na2s2o3: sodium thiosulfate

Condition Upon Receipt Anomaly Form		<input type="checkbox"/> N/A
<ul style="list-style-type: none"> COOLERS <ul style="list-style-type: none"> <input type="checkbox"/> Not Received (received COC only) <input type="checkbox"/> Leaking <input type="checkbox"/> Other: 	<ul style="list-style-type: none"> CUSTODY SEALS (COOLER(S)) <ul style="list-style-type: none"> <input type="checkbox"/> None <input type="checkbox"/> Not Intact <input type="checkbox"/> Other 	<ul style="list-style-type: none"> CONTAINER(S) <ul style="list-style-type: none"> <input type="checkbox"/> None <input type="checkbox"/> Not Intact <input type="checkbox"/> Other
<ul style="list-style-type: none"> TEMPERATURE (SPECS $4 \pm 2^{\circ}\text{C}$) <ul style="list-style-type: none"> <input type="checkbox"/> Cooler Temp(s) <input type="checkbox"/> Temperature Blank(s) 	<ul style="list-style-type: none"> CHAIN OF CUSTODY (COC) <ul style="list-style-type: none"> <input type="checkbox"/> Not relinquished by Client; No date/time relinquished <input type="checkbox"/> Incomplete information provided <input type="checkbox"/> Other <input type="checkbox"/> COC not received – notify PM 	
<ul style="list-style-type: none"> CONTAINERS <ul style="list-style-type: none"> <input type="checkbox"/> Leaking <input type="checkbox"/> Voa Vials with Bubbles > 6mm <input type="checkbox"/> Broken <input checked="" type="checkbox"/> Extra <input type="checkbox"/> Without Labels <input type="checkbox"/> Other: 	<ul style="list-style-type: none"> LABELS <ul style="list-style-type: none"> <input type="checkbox"/> Not the same ID/info as in COC <input type="checkbox"/> Incomplete Information <input type="checkbox"/> Markings/Info illegible <input type="checkbox"/> Torn 	
<ul style="list-style-type: none"> SAMPLES <ul style="list-style-type: none"> <input type="checkbox"/> Samples NOT RECEIVED but listed on COC <input type="checkbox"/> Samples received but NOT LISTED on COC <input type="checkbox"/> Logged based on Label Information <input type="checkbox"/> Logged based on info from other samples on COC <input type="checkbox"/> Logged according to Work Plan <input type="checkbox"/> Logged on HOLD UNTIL FURTHER NOTICE 	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <input type="checkbox"/> Will be noted on COC—Client to send samples with new COC <input type="checkbox"/> Mislabelled as to tests, preservatives, etc. <input type="checkbox"/> Holding time expired – list sample ID and test <input type="checkbox"/> Improper container used <input type="checkbox"/> Not preserved/Improper preservative used <input type="checkbox"/> Improper pH _____ Lab to preserve sample and document <input type="checkbox"/> Insufficient quantities for analysis <input type="checkbox"/> Other 	
Comments: <div> TH & EB samples not on COC </div>		
Corrective Action Implemented: <div> Client Informed: verbally on _____ </div>		
Sample(s) on hold until: _____		
By: _____ In writing on _____ By: _____		
Sample(s) processed "as is."		
Logged by/Date: <div> [Signature] 1/24/05 </div>	PM Review/Date: <div> 1/24 SC </div>	

SECOR International Inc

Client Sample ID: MW-1

GC/MS Volatiles

Lot-Sample #....: E5A210247-001 Work Order #....: G218Q1AN Matrix.....: W
 Date Sampled....: 01/20/05 13:48 Date Received...: 01/21/05 10:30 MS Run #.....: 5034269
 Prep Date.....: 02/03/05 Analysis Date...: 02/03/05
 Prep Batch #....: 5034498 Analysis Time...: 02:16
 Dilution Factor: 1
 Analyst ID.....: 000038 Instrument ID...: MSQ
 Method.....: SW846 8260B

PARAMETER	RESULT	REPORTING	
		LIMIT	UNITS
Diisopropyl Ether (DIPE)	ND	2.0	ug/L
Benzene	ND	1.0	ug/L
Ethanol	ND IO	500	ug/L
Ethylbenzene	ND	1.0	ug/L
tert-Butyl alcohol	ND	25	ug/L
Toluene	ND	1.0	ug/L
o-Xylene	ND	1.0	ug/L
Xylenes (total)	ND	1.0	ug/L
m-Xylene & p-Xylene	ND	1.0	ug/L
Methyl tert-butyl ether (MTBE)	ND	1.0	ug/L
Ethyl-t-Butyl Ether (ETBE)	ND	2.0	ug/L
Tert-amyl methyl ether (TAME)	ND	2.0	ug/L

SURROGATE	PERCENT	RECOVERY
	RECOVERY	LIMITS
Bromofluorobenzene	95	(75 - 120)
1,2-Dichloroethane-d4	105	(65 - 130)
Toluene-d8	102	(80 - 130)

NOTE (S) :

IO Contract limits originate from BP-GCLN Technical Requirements

SECOR International Inc

Client Sample ID: MW-1

GC Volatiles

Lot-Sample #....: E5A210247-001 Work Order #....: G218Q1AD Matrix.....: W
Date Sampled....: 01/20/05 13:48 Date Received...: 01/21/05 10:30 MS Run #.....:
Prep Date.....: 01/26/05 Analysis Date...: 01/26/05
Prep Batch #....: 5027321 Analysis Time...: 14:59
Dilution Factor: 1
Analyst ID.....: 402431 Instrument ID...: GC1
Method.....: RSK SOP-175

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING LIMIT</u>	<u>UNITS</u>
Methane	ND	1.0	ug/L

SECOR International Inc

Client Sample ID: MW-1

GC Volatiles

Lot-Sample #....: E5A210247-001 Work Order #....: G218Q1AP Matrix.....: W
 Date Sampled....: 01/20/05 13:48 Date Received...: 01/21/05 10:30 MS Run #.....: 5025150
 Prep Date.....: 01/24/05 Analysis Date...: 01/24/05
 Prep Batch #....: 5025251 Analysis Time...: 23:26
 Dilution Factor: 1
 Analyst ID.....: 001464 Instrument ID...: G13
 Method.....: SW846 8015B

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING LIMIT</u>	<u>UNITS</u>
GRO (C6 - C12)	ND	100	ug/L

<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
a,a,a-Trifluorotoluene (TFT)	94	(70 - 130)

SECOR International Inc

Client Sample ID: MW-1

TOTAL Metals

Lot-Sample #....: E5A210247-001

Matrix.....: W

Date Sampled....: 01/20/05 13:48 Date Received...: 01/21/05 10:30

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #....: 5024251						
Iron	366	100	ug/L	SW846 6010B	01/24-01/25/05	G218Q1AF
		Dilution Factor: 1		Analysis Time...: 17:28		Analyst ID.....: 021088
		Instrument ID...: M01		MS Run #.....: 5024155		

SECOR International Inc

Client Sample ID: MW-1

General Chemistry

Lot-Sample #....: E5A210247-001 Work Order #....: G218Q Matrix.....: W
 Date Sampled....: 01/20/05 13:48 Date Received...: 01/21/05 10:30

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Ferrous Iron	ND	200	ug/L	SM18 3500-FE D	01/21/05	5021385
		Dilution Factor: 1		Analysis Time...: 12:30	Analyst ID.....: 021088	
		Instrument ID...: NO INST		MS Run #.....: 5021204		
Nitrate as N	4590	500	ug/L	MCAWW 300.0A	01/21/05	5021304
		Dilution Factor: 5		Analysis Time...: 20:49ST	Analyst ID.....: 0000224	
		Instrument ID...: W01		MS Run #.....: 5021216		
Sulfate	442000	25000	ug/L	MCAWW 300.0A	01/21-01/22/05	5021305
		Dilution Factor: 25		Analysis Time...: 08:39	Analyst ID.....: 0000226	
		Instrument ID...: W01		MS Run #.....: 5021217		

SECOR International Inc

Client Sample ID: MW-2

GC/MS Volatiles

Lot-Sample #....: E5A210247-002 Work Order #....: G21841AG Matrix.....: W
Date Sampled....: 01/20/05 12:50 Date Received...: 01/21/05 10:30 MS Run #.....: 5034269
Prep Date.....: 02/03/05 Analysis Date...: 02/03/05
Prep Batch #....: 5034498 Analysis Time...: 02:38
Dilution Factor: 125
Analyst ID.....: 000038 Instrument ID...: MSQ
Method.....: SW846 8260B

PARAMETER	RESULT	REPORTING	
		LIMIT	UNITS
Diisopropyl Ether (DIPE)	ND	250	ug/L
Benzene	230	120	ug/L
Ethanol	ND IO	62000	ug/L
Ethylbenzene	2400	120	ug/L
tert-Butyl alcohol	ND	3100	ug/L
Toluene	3400	120	ug/L
o-Xylene	5100	120	ug/L
Xylenes (total)	14000	120	ug/L
m-Xylene & p-Xylene	9200	120	ug/L
Methyl tert-butyl ether (MTBE)	340	120	ug/L
Ethyl-t-Butyl Ether (ETBE)	ND	250	ug/L
Tert-amyl methyl ether (TAME)	ND	250	ug/L

SURROGATE	PERCENT	RECOVERY
	RECOVERY	LIMITS
Bromofluorobenzene	98	(75 - 120)
1,2-Dichloroethane-d4	114	(65 - 130)
Toluene-d8	100	(80 - 130)

NOTE(S):

IO Contract limits originate from BP-GCLN Technical Requirements

SECOR International Inc

Client Sample ID: MW-2

GC Volatiles

Lot-Sample #....: E5A210247-002 Work Order #....: G21841AD Matrix.....: W
Date Sampled....: 01/20/05 12:50 Date Received...: 01/21/05 10:30 MS Run #.....:
Prep Date.....: 01/26/05 Analysis Date...: 01/26/05
Prep Batch #....: 5027321 Analysis Time...: 15:20
Dilution Factor: 1
Analyst ID.....: 402431 Instrument ID...: GC1
Method.....: RSK SOP-175

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>
Methane	510	1.0	ug/L

SECOR International Inc

Client Sample ID: MW-2

TOTAL Metals

Lot-Sample #....: E5A210247-002

Matrix.....: W

Date Sampled...: 01/20/05 12:50 Date Received...: 01/21/05 10:30

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #....: 5024251						
Iron	1620	100	ug/L	SW846 6010B	01/24-01/25/05	G21841AF
		Dilution Factor: 1		Analysis Time...: 18:10	Analyst ID.....: 021088	
		Instrument ID...: M01		MS Run #.....: 5024155		

SECOR International Inc

Client Sample ID: MW-2

General Chemistry

Lot-Sample #....: E5A210247-002 Work Order #....: G2184 Matrix.....: W
 Date Sampled....: 01/20/05 12:50 Date Received...: 01/21/05 10:30

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Ferrous Iron	1100	200	ug/L	SM18 3500-FE D	01/21/05	5021385
				Dilution Factor: 1	Analysis Time...: 12:30	Analyst ID.....: 0210887
				Instrument ID...: NO INST	MS Run #.....: 5021204	
Nitrate as N	ND	100	ug/L	MCAWW 300.0A	01/21/05	5021304
				Dilution Factor: 1	Analysis Time...: 21:05ST	Analyst ID.....: 0000224
				Instrument ID...: W01	MS Run #.....: 5021216	
Sulfate	2480	1000	ug/L	MCAWW 300.0A	01/21/05	5021305
				Dilution Factor: 1	Analysis Time...: 21:05	Analyst ID.....: 0000226
				Instrument ID...: W01	MS Run #.....: 5021217	

Client Sample ID: MW-3

```

Lot-Sample #....: E5A210247-003   Work Order #....: G21851AG           Matrix.....: W
Date Sampled....: 01/20/05 14:10   Date Received...: 01/21/05 10:30   MS Run #.....: 5034269
Prep Date.....: 02/03/05           Analysis Date...: 02/03/05
Prep Batch #....: 5034498           Analysis Time...: 03:00
Dilution Factor: 1
Analyst ID.....: 000038           Instrument ID...: MSQ
Method.....: SW846 8260B

```

PARAMETER	RESULT	REPORTING	
		LIMIT	UNITS
Diisopropyl Ether (DIPE)	ND	2.0	ug/L
Benzene	ND	1.0	ug/L
Ethanol	ND IO	500	ug/L
Ethylbenzene	ND	1.0	ug/L
tert-Butyl alcohol	ND	25	ug/L
Toluene	ND	1.0	ug/L
o-Xylene	ND	1.0	ug/L
Xylenes (total)	ND	1.0	ug/L
m-Xylene & p-Xylene	ND	1.0	ug/L
Methyl tert-butyl ether (MTBE)	ND	1.0	ug/L
Ethyl-t-Butyl Ether (ETBE)	ND	2.0	ug/L
Tert-amyl methyl ether (TAME)	ND	2.0	ug/L

<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
Bromofluorobenzene	94	(75 - 120)
1,2-Dichloroethane-d4	111	(65 - 130)
Toluene-d8	100	(80 - 130)

NOTE (S) :

10 Contract limits originate from BP-GCLN Technical Requirements

SECOR International Inc

Client Sample ID: MW-3

GC Volatiles

Lot-Sample #....: E5A210247-003 Work Order #....: G21851AD Matrix.....: W
Date Sampled....: 01/20/05 14:10 Date Received...: 01/21/05 10:30 MS Run #.....:
Prep Date.....: 01/26/05 Analysis Date...: 01/26/05
Prep Batch #....: 5027321 Analysis Time...: 15:50
Dilution Factor: 1
Analyst ID.....: 402431 Instrument ID...: GC1
Method.....: RSK SOP-175

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>
Methane	ND	1.0	ug/L

SECOR International Inc

Client Sample ID: MW-3

TOTAL Metals

Lot-Sample #....: E5A210247-003

Matrix.....: W

Date Sampled....: 01/20/05 14:10 Date Received...: 01/21/05 10:30

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #....: 5024251						
Iron	590	100	ug/L	SW846 6010B	01/24-01/25/05	G21851AF
		Dilution Factor: 1		Analysis Time...: 18:17		Analyst ID.....: 021088
		Instrument ID...: M01		MS Run #.....: 5024155		

SECOR International Inc

Client Sample ID: MW-3

General Chemistry

Lot-Sample #....: E5A210247-003 Work Order #....: G2185 Matrix.....: W
 Date Sampled....: 01/20/05 14:10 Date Received...: 01/21/05 10:30

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Ferrous Iron	ND	200	ug/L	SM18 3500-FE D	01/21/05	5021385
				Dilution Factor: 1	Analysis Time...: 12:30	Analyst ID.....: 0210887
				Instrument ID...: NO INST	MS Run #.....: 5021204	
Nitrate as N	4230	500	ug/L	MCAWW 300.0A	01/21/05	5021304
				Dilution Factor: 5	Analysis Time...: 21:22ST	Analyst ID.....: 0000224
				Instrument ID...: W01	MS Run #.....: 5021216	
Sulfate	374000	25000	ug/L	MCAWW 300.0A	01/21/05	5021305
				Dilution Factor: 25	Analysis Time...: 09:12	Analyst ID.....: 0000226
				Instrument ID...: W01	MS Run #.....: 5021217	

SECOR International Inc

Client Sample ID: MW-4

GC/MS Volatiles

Lot-Sample #....: E5A210247-004 Work Order #....: G219C1AG Matrix.....: W
 Date Sampled....: 01/20/05 14:30 Date Received...: 01/21/05 10:30 MS Run #.....: 5034269
 Prep Date.....: 02/03/05 Analysis Date...: 02/03/05
 Prep Batch #....: 5034498 Analysis Time...: 03:21
 Dilution Factor: 1
 Analyst ID.....: 000038 Instrument ID...: MSQ
 Method.....: SW846 8260B

PARAMETER	RESULT	REPORTING	
		LIMIT	UNITS
Diisopropyl Ether (DIPE)	ND	2.0	ug/L
Benzene	ND	1.0	ug/L
Ethanol	ND IO	500	ug/L
Ethylbenzene	ND	1.0	ug/L
tert-Butyl alcohol	ND	25	ug/L
Toluene	ND	1.0	ug/L
o-Xylene	ND	1.0	ug/L
Xylenes (total)	ND	1.0	ug/L
m-Xylene & p-Xylene	ND	1.0	ug/L
Methyl tert-butyl ether (MTBE)	ND	1.0	ug/L
Ethyl-t-Butyl Ether (ETBE)	ND	2.0	ug/L
Tert-amyl methyl ether (TAME)	ND	2.0	ug/L
SURROGATE	PERCENT		RECOVERY
	RECOVERY		LIMITS
Bromofluorobenzene	97		(75 - 120)
1,2-Dichloroethane-d4	111		(65 - 130)
Toluene-d8	104		(80 - 130)

NOTE (S) :

IO Contract limits originate from BP-GCLN Technical Requirements

SECOR International Inc

Client Sample ID: MW-4

GC Volatiles

Lot-Sample #....: E5A210247-004 Work Order #....: G219C1AD Matrix.....: W
Date Sampled....: 01/20/05 14:30 Date Received...: 01/21/05 10:30 MS Run #.....:
Prep Date.....: 01/26/05 Analysis Date...: 01/26/05
Prep Batch #....: 5027321 Analysis Time...: 16:14
Dilution Factor: 1
Analyst ID.....: 402431 Instrument ID...: GC1
Method.....: RSK SOP-175

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>
Methane	ND	1.0	ug/L

SECOR International Inc

Client Sample ID: MW-4

GC Volatiles

Lot-Sample #....: E5A210247-004 Work Order #....: G219C1AH Matrix.....: W
 Date Sampled....: 01/20/05 14:30 Date Received...: 01/21/05 10:30 MS Run #.....: 5025150
 Prep Date.....: 01/24/05 Analysis Date...: 01/25/05
 Prep Batch #....: 5025251 Analysis Time...: 00:50
 Dilution Factor: 1
 Analyst ID.....: 001464 Instrument ID...: G13
 Method.....: SW846 8015B

PARAMETER	RESULT	REPORTING LIMIT	UNITS
GRO (C6 - C12)	ND	100	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
a,a,a-Trifluorotoluene (TFT)	90	(70 - 130)

SECOR International Inc

Client Sample ID: MW-4

TOTAL Metals

Lot-Sample #....: E5A210247-004

Matrix.....: W

Date Sampled...: 01/20/05 14:30 Date Received...: 01/21/05 10:30

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #....: 5024251						
Iron	176	100	ug/L	SW846 6010B	01/24-01/25/05	G219C1AF
		Dilution Factor: 1		Analysis Time...: 18:25	Analyst ID.....: 021088	
		Instrument ID...: M01		MS Run #.....: 5024155		

SECOR International Inc

Client Sample ID: MW-4

General Chemistry

Lot-Sample #....: E5A210247-004 Work Order #....: G219C Matrix.....: W
 Date Sampled....: 01/20/05 14:30 Date Received...: 01/21/05 10:30

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Ferrous Iron	ND	200	ug/L	SM18 3500-FE D	01/21/05	5021385
		Dilution Factor: 1		Analysis Time...: 12:30	Analyst ID.....: 0210887	
		Instrument ID...: NO INST		MS Run #.....: 5021204		
Nitrate as N	713	100	ug/L	MCAWW 300.0A	01/21-01/22/05	5021304
		Dilution Factor: 1		Analysis Time...: 10:02ST	Analyst ID.....: 0000224	
		Instrument ID...: W01		MS Run #.....: 5021216		
Sulfate	689000	25000	ug/L	MCAWW 300.0A	01/21-01/22/05	5021305
		Dilution Factor: 25		Analysis Time...: 13:36	Analyst ID.....: 0000226	
		Instrument ID...: W01		MS Run #.....: 5021217		

Client Sample ID: MW-5

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Lot-Sample #....: E5A210247-005   Work Order #....: G219D1AG           Matrix.....: W
Date Sampled...: 01/20/05 13:23   Date Received...: 01/21/05 10:30   MS Run #.....: 5034269
Prep Date.....: 02/03/05           Analysis Date...: 02/03/05
Prep Batch #....: 5034498           Analysis Time...: 03:43
Dilution Factor: 5
Analyst ID.....: 000038           Instrument ID...: MSQ
                                   Method.....: SW846 8260B

```

PARAMETER	RESULT	REPORTING	
		LIMIT	UNITS
Diisopropyl Ether (DIPE)	ND	10	ug/L
Benzene	ND	5.0	ug/L
Ethanol	ND IO	2500	ug/L
Ethylbenzene	65	5.0	ug/L
tert-Butyl alcohol	ND	120	ug/L
Toluene	ND	5.0	ug/L
o-Xylene	ND	5.0	ug/L
Xylenes (total)	ND	5.0	ug/L
m-Xylene & p-Xylene	ND	5.0	ug/L
Methyl tert-butyl ether (MTBE)	390	5.0	ug/L
Ethyl-t-Butyl Ether (ETBE)	ND	10	ug/L
Tert-amyl methyl ether (TAME)	ND	10	ug/L

<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
Bromofluorobenzene	99	(75 - 120)
1,2-Dichloroethane-d4	109	(65 - 130)
Toluene-d8	99	(80 - 130)

IO Contract limits originate from BP-GCLN Technical Requirements

SECOR International Inc

Client Sample ID: MW-5

GC Volatiles

Lot-Sample #....: E5A210247-005 Work Order #....: G219D1AD Matrix.....: W
 Date Sampled....: 01/20/05 13:23 Date Received...: 01/21/05 10:30 MS Run #.....:
 Prep Date.....: 01/26/05 Analysis Date...: 01/26/05
 Prep Batch #....: 5027321 Analysis Time...: 16:38
 Dilution Factor: 1
 Analyst ID.....: 402431 Instrument ID...: GC1
 Method.....: RSK SOP-175

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING LIMIT</u>	<u>UNITS</u>
Methane	370	1.0	ug/L

SECOR International Inc

Client Sample ID: MW-5

GC Volatiles

Lot-Sample #....: E5A210247-005 Work Order #....: G219D1AH Matrix.....: W
 Date Sampled....: 01/20/05 13:23 Date Received...: 01/21/05 10:30 MS Run #.....: 5025150
 Prep Date.....: 01/24/05 Analysis Date...: 01/25/05
 Prep Batch #....: 5025251 Analysis Time...: 01:17
 Dilution Factor: 1
 Analyst ID.....: 001464 Instrument ID...: G13
 Method.....: SW846 8015B

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING LIMIT</u>	<u>UNITS</u>
GRO (C6 - C12)	1400	100	ug/L

<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
a,a,a-Trifluorotoluene (TFT)	120	(70 - 130)

SECOR International Inc

Client Sample ID: MW-5

TOTAL Metals

Lot-Sample #...: E5A210247-005

Matrix.....: W

Date Sampled...: 01/20/05 13:23 Date Received...: 01/21/05 10:30

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 5024251						
Iron	670	100	ug/L	SW846 6010B	01/24-01/25/05	G219D1AF
		Dilution Factor: 1		Analysis Time...: 18:32		Analyst ID.....: 021088
		Instrument ID...: M01		MS Run #.....: 5024155		

SECOR International Inc

Client Sample ID: MW-5

General Chemistry

Lot-Sample #....: E5A210247-005 Work Order #....: G219D Matrix.....: W
 Date Sampled....: 01/20/05 13:23 Date Received...: 01/21/05 10:30

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Ferrous Iron	ND	200	ug/L	SM18 3500-FE D	01/21/05	5021385
		Dilution Factor: 1		Analysis Time...: 12:30	Analyst ID.....: 0210887	
		Instrument ID...: NO INST		MS Run #.....: 5021204		
Nitrate as N	ND	100	ug/L	MCAWW 300.0A	01/21-01/22/05	5021304
		Dilution Factor: 1		Analysis Time...: 10:18ST	Analyst ID.....: 0000224	
		Instrument ID...: W01		MS Run #.....: 5021216		
Sulfate	806000	50000	ug/L	MCAWW 300.0A	01/21-01/22/05	5021305
		Dilution Factor: 50		Analysis Time...: 13:53	Analyst ID.....: 0000226	
		Instrument ID...: W01		MS Run #.....: 5021217		

SECOR International Inc

Client Sample ID: MW-6

GC/MS Volatiles

Lot-Sample #...: E5A210247-006 Work Order #...: G219E1AG Matrix.....: W
 Date Sampled...: 01/20/05 14:48 Date Received...: 01/21/05 10:30 MS Run #.....: 5034269
 Prep Date.....: 02/03/05 Analysis Date...: 02/03/05
 Prep Batch #...: 5034498 Analysis Time...: 04:04
 Dilution Factor: 125
 Analyst ID.....: 000038 Instrument ID...: MSQ
 Method.....: SW846 8260B

PARAMETER	RESULT	REPORTING	
		LIMIT	UNITS
Diisopropyl Ether (DIPE)	ND	250	ug/L
Benzene	1800	120	ug/L
Ethanol	ND IO	62000	ug/L
Ethylbenzene	1600	120	ug/L
tert-Butyl alcohol	ND	3100	ug/L
Toluene	1600	120	ug/L
o-Xylene	2800	120	ug/L
Xylenes (total)	6300	120	ug/L
m-Xylene & p-Xylene	3600	120	ug/L
Methyl tert-butyl ether (MTBE)	5600	120	ug/L
Ethyl-t-Butyl Ether (ETBE)	ND	250	ug/L
Tert-amyl methyl ether (TAME)	ND	250	ug/L
SURROGATE	PERCENT RECOVERY	RECOVERY	
		LIMITS	
Bromofluorobenzene	94	(75 - 120)	
1,2-Dichloroethane-d4	101	(65 - 130)	
Toluene-d8	98	(80 - 130)	

NOTE(S) :

IO Contract limits originate from BP-GCLN Technical Requirements

SECOR International Inc

Client Sample ID: MW-6

GC Volatiles

Lot-Sample #....: E5A210247-006 Work Order #....: G219E1AD Matrix.....: W
Date Sampled....: 01/20/05 14:48 Date Received...: 01/21/05 10:30 MS Run #.....:
Prep Date.....: 01/26/05 Analysis Date...: 01/26/05
Prep Batch #....: 5027321 Analysis Time...: 17:01
Dilution Factor: 1
Analyst ID.....: 402431 Instrument ID...: GC1
Method.....: RSK SOP-175

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>
Methane	370	1.0	ug/L

Client Sample ID: MW-6

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Lot-Sample #....: E5A210247-006   Work Order #....: G219E1AH           Matrix.....: W
Date Sampled...: 01/20/05 14:48   Date Received...: 01/21/05 10:30   MS Run #.....: 5025150
Prep Date.....: 01/24/05           Analysis Date...: 01/25/05
Prep Batch #...: 5025251           Analysis Time...: 04:05
Dilution Factor: 10
Analyst ID.....: 001464           Instrument ID...: G13
                                   Method.....: SW846 8015B

```

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING LIMIT</u>	<u>UNITS</u>
GRO (C6 - C12)	20000	1000	ug/L
<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>	
a,a,a-Trifluorotoluene (TFT)	104	(70 - 130)	

SECOR International Inc

Client Sample ID: MW-6

TOTAL Metals

Lot-Sample #...: E5A210247-006

Matrix.....: W

Date Sampled...: 01/20/05 14:48 Date Received...: 01/21/05 10:30

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 5024251						
Iron.	836	100	ug/L	SW846 6010B	01/24-01/25/05	G219E1AF
		Dilution Factor: 1		Analysis Time...: 18:40	Analyst ID.....: 021088	
		Instrument ID...: M01		MS Run #.....: 5024155		

SECOR International Inc

Client Sample ID: MW-6

General Chemistry

Lot-Sample #....: E5A210247-006 Work Order #....: G219E Matrix.....: W
 Date Sampled....: 01/20/05 14:48 Date Received...: 01/21/05 10:30

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Ferrous Iron	853	200	ug/L	SM18 3500-FE D	01/21/05	5021385
		Dilution Factor: 1		Analysis Time...: 12:30	Analyst ID.....: 0210887	
		Instrument ID...: NO INST		MS Run #.....: 5021204		
Nitrate as N	ND	100	ug/L	MCAWW 300.0A	01/21-01/22/05	5021304
		Dilution Factor: 1		Analysis Time...: 10:35ST	Analyst ID.....: 0000224	
		Instrument ID...: W01		MS Run #.....: 5021216		
Sulfate	49500	1000	ug/L	MCAWW 300.0A	01/21/05	5021305
		Dilution Factor: 1		Analysis Time...: 22:11	Analyst ID.....: 0000226	
		Instrument ID...: W01		MS Run #.....: 5021217		

SECOR International Inc

Client Sample ID: MW-7

GC/MS Volatiles

Lot-Sample #....: E5A210247-007 Work Order #....: G219G1AG Matrix.....: W
Date Sampled....: 01/20/05 14:14 Date Received...: 01/21/05 10:30 MS Run #.....: 5034312
Prep Date.....: 02/03/05 Analysis Date...: 02/03/05
Prep Batch #....: 5034565 Analysis Time...: 13:14
Dilution Factor: 1
Analyst ID.....: 015590 Instrument ID...: MSQ
Method.....: SW846 8260B

		REPORTING	
PARAMETER	RESULT	LIMIT	UNITS
Diisopropyl Ether (DIPE)	ND	2.0	ug/L
Benzene	ND	1.0	ug/L
Ethanol	ND IO	500	ug/L
Ethylbenzene	ND	1.0	ug/L
tert-Butyl alcohol	ND IB	25	ug/L
Toluene	ND	1.0	ug/L
o-Xylene	ND	1.0	ug/L
Xylenes (total)	ND	1.0	ug/L
m-Xylene & p-Xylene	ND	1.0	ug/L
Methyl tert-butyl ether (MTBE)	ND	1.0	ug/L
Ethyl-t-Butyl Ether (ETBE)	ND	2.0	ug/L
Tert-amyl methyl ether (TAME)	ND	2.0	ug/L
		PERCENT	RECOVERY
SURROGATE	RECOVERY	LIMITS	
Bromofluorobenzene	96	(75 - 120)	
1,2-Dichloroethane-d4	105	(65 - 130)	
Toluene-d8	102	(80 - 130)	

NOTE(S) :

IO Contract limits originate from BP-GCLN Technical Requirements
IB CCV recovery above limit; analyte not detected.

SECOR International Inc

Client Sample ID: MW-7

GC Volatiles

Lot-Sample #....: E5A210247-007 Work Order #....: G219G1AD Matrix.....: W
Date Sampled....: 01/20/05 14:14 Date Received...: 01/21/05 10:30 MS Run #.....:
Prep Date.....: 01/26/05 Analysis Date...: 01/26/05
Prep Batch #....: 5027321 Analysis Time...: 17:26
Dilution Factor: 1
Analyst ID.....: 402431 Instrument ID...: GC1
Method.....: RSK SOP-175

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING LIMIT</u>	<u>UNITS</u>
Methane	ND	1.0	ug/L

SECOR International Inc

Client Sample ID: MW-7

GC Volatiles

Lot-Sample #....: E5A210247-007 Work Order #....: G219G1AH Matrix.....: W
 Date Sampled....: 01/20/05 14:14 Date Received...: 01/21/05 10:30 MS Run #.....: 5025150
 Prep Date.....: 01/24/05 Analysis Date...: 01/25/05
 Prep Batch #....: 5025251 Analysis Time...: 01:45
 Dilution Factor: 1
 Analyst ID.....: 001464 Instrument ID...: G13
 Method.....: SW846 8015B

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING LIMIT</u>	<u>UNITS</u>
GRO (C6 - C12)	ND	100	ug/L

<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
a,a,a-Trifluorotoluene (TFT)	92	(70 - 130)

SECOR International Inc

Client Sample ID: MW-7

TOTAL Metals

Lot-Sample #....: E5A210247-007

Matrix.....: W

Date Sampled...: 01/20/05 14:14 Date Received...: 01/21/05 10:30

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #....: 5024251						
Iron	301	100	ug/L	SW846 6010B	01/24-01/25/05	G219G1AF
		Dilution Factor: 1		Analysis Time...: 18:48		Analyst ID.....: 021088
		Instrument ID...: M01		MS Run #.....: 5024155		

SECOR International Inc

Client Sample ID: MW-7

General Chemistry

Lot-Sample #....: E5A210247-007 Work Order #....: G219G Matrix.....: W
 Date Sampled....: 01/20/05 14:14 Date Received...: 01/21/05 10:30

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Ferrous Iron	ND	200	ug/L	SM18 3500-FE D	01/21/05	5021385
				Dilution Factor: 1	Analysis Time...: 12:30	Analyst ID.....: 0210887
				Instrument ID...: NO INST	MS Run #.....: 5021204	
Nitrate as N	192	100	ug/L	MCAWW 300.0A	01/21-01/22/05	5021304
				Dilution Factor: 1	Analysis Time...: 10:51ST	Analyst ID.....: 0000224
				Instrument ID...: W01	MS Run #.....: 5021216	
Sulfate	449000	50000	ug/L	MCAWW 300.0A	01/21-01/22/05	5021305
				Dilution Factor: 50	Analysis Time...: 14:26	Analyst ID.....: 0000226
				Instrument ID...: W01	MS Run #.....: 5021217	

SECOR International Inc

Client Sample ID: MW-8

GC/MS Volatiles

Lot-Sample #....: E5A210247-008 Work Order #....: G219J1AG Matrix.....: W
 Date Sampled....: 01/20/05 13:15 Date Received...: 01/21/05 10:30 MS Run #.....: 5034312
 Prep Date.....: 02/03/05 Analysis Date...: 02/03/05
 Prep Batch #....: 5034565 Analysis Time...: 13:36
 Dilution Factor: 1
 Analyst ID.....: 015590 Instrument ID...: MSQ
 Method.....: SW846 8260B

		REPORTING	
PARAMETER	RESULT	LIMIT	UNITS
Diisopropyl Ether (DIPE)	ND	2.0	ug/L
Benzene	ND	1.0	ug/L
Ethanol	ND IO	500	ug/L
Ethylbenzene	ND	1.0	ug/L
tert-Butyl alcohol	ND IB	25	ug/L
Toluene	ND	1.0	ug/L
o-Xylene	ND	1.0	ug/L
Xylenes (total)	ND	1.0	ug/L
m-Xylene & p-Xylene	ND	1.0	ug/L
Methyl tert-butyl ether (MTBE)	ND	1.0	ug/L
Ethyl-t-Butyl Ether (ETBE)	ND	2.0	ug/L
Tert-amyl methyl ether (TAME)	ND	2.0	ug/L
		PERCENT	RECOVERY
SURROGATE	RECOVERY	LIMITS	
Bromofluorobenzene	94	(75 - 120)	
1,2-Dichloroethane-d4	96	(65 - 130)	
Toluene-d8	100	(80 - 130)	

NOTE (S) :

IO Contract limits originate from BP-GCLN Technical Requirements
 IB CCV recovery above limit; analyte not detected.

SECOR International Inc

Client Sample ID: MW-8

GC Volatiles

Lot-Sample #....: E5A210247-008 Work Order #....: G219J1AD Matrix.....: W
Date Sampled....: 01/20/05 13:15 Date Received...: 01/21/05 10:30 MS Run #.....:
Prep Date.....: 01/26/05 Analysis Date...: 01/26/05
Prep Batch #....: 5027321 Analysis Time...: 17:54
Dilution Factor: 1
Analyst ID.....: 402431 Instrument ID...: GC1
Method.....: RSK SOP-175

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>
Methane	ND	1.0	ug/L

SECOR International Inc

Client Sample ID: MW-8

GC Volatiles

Lot-Sample #....: E5A210247-008 Work Order #....: G219J1AH Matrix.....: W
 Date Sampled....: 01/20/05 13:15 Date Received...: 01/21/05 10:30 MS Run #.....: 5025150
 Prep Date.....: 01/24/05 Analysis Date...: 01/25/05
 Prep Batch #....: 5025251 Analysis Time...: 04:33
 Dilution Factor: 1
 Analyst ID.....: 001464 Instrument ID...: G13
 Method.....: SW846 8015B

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING LIMIT</u>	<u>UNITS</u>
GRO (C6 - C12)	ND	100	ug/L

<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
a,a,a-Trifluorotoluene (TFT)	94	(70 - 130)

SECOR International Inc

Client Sample ID: MW-8

TOTAL Metals

Lot-Sample #...: E5A210247-008

Matrix.....: W

Date Sampled...: 01/20/05 13:15 Date Received...: 01/21/05 10:30

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 5024251						
Iron	435	100	ug/L	SW846 6010B	01/24-01/25/05	G219J1AF
		Dilution Factor: 1		Analysis Time...: 18:59		Analyst ID.....: 021088
		Instrument ID...: M01		MS Run #.....: 5024155		

SECOR International Inc

Client Sample ID: MW-8

General Chemistry

Lot-Sample #...: E5A210247-008 Work Order #...: G219J Matrix.....: W
 Date Sampled...: 01/20/05 13:15 Date Received...: 01/21/05 10:30

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Ferrous Iron	ND	200	ug/L	SM18 3500-FE D	01/21/05	5021385
				Dilution Factor: 1	Analysis Time...: 12:30	Analyst ID.....: 0210887
				Instrument ID...: NO INST	MS Run #.....: 5021204	
Nitrate as N	183	100	ug/L	MCAWW 300.0A	01/21-01/22/05	5021304
				Dilution Factor: 1	Analysis Time...: 11:08ST	Analyst ID.....: 0000224
				Instrument ID...: W01	MS Run #.....: 5021216	
Sulfate	325000	50000	ug/L	MCAWW 300.0A	01/21-01/22/05	5021305
				Dilution Factor: 50	Analysis Time...: 14:42	Analyst ID.....: 0000226
				Instrument ID...: W01	MS Run #.....: 5021217	

SECOR International Inc

Client Sample ID: MW-9

GC/MS Volatiles

Lot-Sample #....: E5A210247-009 Work Order #....: G219N1AG Matrix.....: W
 Date Sampled....: 01/20/05 14:04 Date Received...: 01/21/05 10:30 MS Run #.....: 5034312
 Prep Date.....: 02/03/05 Analysis Date...: 02/03/05
 Prep Batch #....: 5034565 Analysis Time...: 13:58
 Dilution Factor: 1
 Analyst ID.....: 015590 Instrument ID...: MSQ
 Method.....: SW846 8260B

PARAMETER	RESULT	REPORTING	
		LIMIT	UNITS
Diisopropyl Ether (DIPE)	ND	2.0	ug/L
Benzene	ND	1.0	ug/L
Ethanol	ND IO	500	ug/L
Ethylbenzene	ND	1.0	ug/L
tert-Butyl alcohol	ND IB	25	ug/L
Toluene	ND	1.0	ug/L
o-Xylene	ND	1.0	ug/L
Xylenes (total)	ND	1.0	ug/L
m-Xylene & p-Xylene	ND	1.0	ug/L
Methyl tert-butyl ether (MTBE)	ND	1.0	ug/L
Ethyl-t-Butyl Ether (ETBE)	ND	2.0	ug/L
Tert-amyl methyl ether (TAME)	ND	2.0	ug/L

SURROGATE	PERCENT	RECOVERY
	RECOVERY	LIMITS
Bromofluorobenzene	96	(75 - 120)
1,2-Dichloroethane-d4	104	(65 - 130)
Toluene-d8	102	(80 - 130)

NOTE(S) :

IO Contract limits originate from BP-GCLN Technical Requirements
 IB CCV recovery above limit; analyte not detected.

SECOR International Inc

Client Sample ID: MW-9

GC Volatiles

Lot-Sample #....: E5A210247-009 Work Order #....: G219N1AD Matrix.....: W
Date Sampled...: 01/20/05 14:04 Date Received...: 01/21/05 10:30 MS Run #.....:
Prep Date.....: 01/26/05 Analysis Date...: 01/26/05
Prep Batch #....: 5027321 Analysis Time...: 18:19
Dilution Factor: 1
Analyst ID.....: 402431 Instrument ID...: GC1
Method.....: RSK SOP-175

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>
Methane	ND	1.0	ug/L

Client Sample ID: MW-9

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Lot-Sample #....: E5A210247-009   Work Order #....: G219N1AH           Matrix.....: W
Date Sampled...: 01/20/05 14:04   Date Received...: 01/21/05 10:30   MS Run #.....: 5025150
Prep Date.....: 01/24/05           Analysis Date...: 01/25/05
Prep Batch #...: 5025251           Analysis Time...: 05:01
Dilution Factor: 1
Analyst ID.....: 001464           Instrument ID...: G13
Method.....: SW846 8015B

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PARAMETER	RESULT	REPORTING LIMIT	UNITS
GRO (C6 - C12)	ND	100	ug/L
SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS	
a,a,a-Trifluorotoluene (TFT)	93	(70 - 130)	

SECOR International Inc

Client Sample ID: MW-9

TOTAL Metals

Lot-Sample #...: E5A210247-009

Matrix.....: W

Date Sampled...: 01/20/05 14:04 Date Received...: 01/21/05 10:30

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 5024251						
Iron	172	100	ug/L	SW846 6010B	01/24-01/25/05	G219N1AF
		Dilution Factor: 1		Analysis Time...: 19:07		Analyst ID.....: 021088
		Instrument ID...: M01		MS Run #.....: 5024155		

SECOR International Inc

Client Sample ID: MW-9

General Chemistry

Lot-Sample #....: E5A210247-009 Work Order #....: G219N Matrix.....: W
 Date Sampled....: 01/20/05 14:04 Date Received...: 01/21/05 10:30

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Ferrous Iron	ND	200	ug/L	SM18 3500-FE D	01/21/05	5021385
				Dilution Factor: 1	Analysis Time...: 12:30	Analyst ID.....: 0210887
				Instrument ID...: NO INST	MS Run #.....: 5021204	
Nitrate as N	1020	100	ug/L	MCAWW 300.0A	01/21-01/22/05	5021304
				Dilution Factor: 1	Analysis Time...: 11:24ST	Analyst ID.....: 0000224
				Instrument ID...: W01	MS Run #.....: 5021216	
Sulfate	453000	50000	ug/L	MCAWW 300.0A	01/21-01/22/05	5021305
				Dilution Factor: 50	Analysis Time...: 14:59	Analyst ID.....: 0000226
				Instrument ID...: W01	MS Run #.....: 5021217	

METHOD BLANK REPORT

GC/MS Volatiles

Client Lot #...: E5A210247
 MB Lot-Sample #: E5B030000-498
 Analysis Date...: 02/02/05
 Dilution Factor: 1

Work Order #...: G3Q3D1AA
 Prep Date.....: 02/02/05
 Prep Batch #...: 5034498
 Analyst ID.....: 000038

Matrix.....: WATER
 Analysis Time...: 22:29
 Instrument ID...: MSQ

PARAMETER	RESULT	REPORTING		METHOD
		LIMIT	UNITS	
Benzene	ND	1.0	ug/L	SW846 8260B
Ethanol	ND IO	500	ug/L	SW846 8260B
Ethylbenzene	ND	1.0	ug/L	SW846 8260B
tert-Butyl alcohol	ND	25	ug/L	SW846 8260B
Toluene	ND	1.0	ug/L	SW846 8260B
o-Xylene	ND	1.0	ug/L	SW846 8260B
Xylenes (total)	ND	1.0	ug/L	SW846 8260B
m-Xylene & p-Xylene	ND	1.0	ug/L	SW846 8260B
Methyl tert-butyl ether (MTBE)	ND	1.0	ug/L	SW846 8260B
Diisopropyl Ether (DIPE)	ND	2.0	ug/L	SW846 8260B
Ethyl-t-Butyl Ether (ETBE)	ND	2.0	ug/L	SW846 8260B
Tert-amyl methyl ether (T	ND	2.0	ug/L	SW846 8260B

SURROGATE	PERCENT	RECOVERY
	RECOVERY	LIMITS
Bromofluorobenzene	87	(75 - 120)
1,2-Dichloroethane-d4	93	(65 - 130)
Toluene-d8	92	(80 - 130)

NOTE (S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.
 IO Contract limits originate from BP-GCLN Technical Requirements

METHOD BLANK REPORT

GC/MS Volatiles

Client Lot #....: E5A210247
MB Lot-Sample #: E5B030000-565

Work Order #....: G3RD51AA

Matrix.....: WATER

Analysis Date...: 02/03/05
Dilution Factor: 1

Prep Date.....: 02/03/05

Analysis Time...: 11:59

Prep Batch #....: 5034565

Instrument ID...: MSQ

Analyst ID.....: 015590

PARAMETER	RESULT	REPORTING		METHOD
		LIMIT	UNITS	
Benzene	ND	1.0	ug/L	SW846 8260B
Ethanol	ND IO	500	ug/L	SW846 8260B
Ethylbenzene	ND	1.0	ug/L	SW846 8260B
tert-Butyl alcohol	ND	25	ug/L	SW846 8260B
Toluene	ND	1.0	ug/L	SW846 8260B
o-Xylene	ND	1.0	ug/L	SW846 8260B
Xylenes (total)	ND	1.0	ug/L	SW846 8260B
m-Xylene & p-Xylene	ND	1.0	ug/L	SW846 8260B
Methyl tert-butyl ether (MTBE)	ND	1.0	ug/L	SW846 8260B
Diisopropyl Ether (DIPE)	ND	2.0	ug/L	SW846 8260B
Ethyl-t-Butyl Ether (ETBE)	ND	2.0	ug/L	SW846 8260B
Tert-amyl methyl ether (T	ND	2.0	ug/L	SW846 8260B
SURROGATE	PERCENT		RECOVERY	
	RECOVERY		LIMITS	
Bromofluorobenzene	81		(75 - 120)	
1,2-Dichloroethane-d4	114		(65 - 130)	
Toluene-d8	86		(80 - 130)	

NOTE (S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

IO Contract limits originate from BP-GCLN Technical Requirements

METHOD BLANK REPORT

GC Volatiles

Client Lot #....: E5A210247 Work Order #....: G3AQW1AA Matrix.....: WATER
 MB Lot-Sample #: M5A270000-321
 Analysis Date...: 01/26/05 Prep Date.....: 01/26/05 Analysis Time...: 10:29
 Dilution Factor: 1 Prep Batch #....: 5027321 Instrument ID...: GC1
 Analyst ID.....: 402431

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD
Methane	ND	1.0	ug/L	RSK SOP-175

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT

GC Volatiles

Client Lot #....: E5A210247 Work Order #....: G26QL1AA Matrix.....: WATER
 MB Lot-Sample #: E5A250000-251
 Analysis Date...: 01/24/05 Prep Date.....: 01/24/05 Analysis Time...: 21:34
 Dilution Factor: 1 Prep Batch #....: 5025251 Instrument ID...: G13
 Analyst ID.....: 001464

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD
GRO (C6 - C12)	ND	100	ug/L	SW846 8015B

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
a,a,a-Trifluorotoluene (TFT)	94	(70 - 130)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT

TOTAL Metals

Client Lot #...: E5A210247

Matrix.....: WATER

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
MB Lot-Sample #:	E5A240000-251	Prep Batch #...	5024251			
Iron	ND	100	ug/L	SWB46 6010B	01/24-01/25/05	G240T1AA
		Dilution Factor:	1			
		Analysis Time..	17:15	Analyst ID.....	021088	Instrument ID... M01

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT

General Chemistry

Client Lot #....: E5A210247

Matrix.....: WATER

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Ferrous Iron	ND	200	ug/L	SM18 3500-FE D	01/21/05	5021385
Work Order #: G227V1AA MB Lot-Sample #: E5A210000-385 Dilution Factor: 1 Analysis Time...: 12:30 Analyst ID.....: 021088 Instrument ID...: W01						
Nitrate as N	ND	100	ug/L	MCAWW 300.0A	01/21/05	5021304
Work Order #: G23ET1AA MB Lot-Sample #: E5A210000-304 Dilution Factor: 1 Analysis Time...: 20:32 Analyst ID.....: 000022 Instrument ID...: W01						
Sulfate	ND	1000	ug/L	MCAWW 300.0A	01/21/05	5021305
Work Order #: G23EW1AA MB Lot-Sample #: E5A210000-305 Dilution Factor: 1 Analysis Time...: 20:32 Analyst ID.....: 000022 Instrument ID...: W01						

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE DATA REPORT

GC/MS Volatiles

Client Lot #....: E5A210247 Work Order #....: G3Q3D1AC Matrix.....: WATER
 LCS Lot-Sample#: E5B030000-498
 Prep Date.....: 02/02/05 Analysis Date...: 02/02/05
 Prep Batch #....: 5034498 Analysis Time...: 22:07
 Dilution Factor: 1 Instrument ID...: MSQ
 Analyst ID.....: 000038

PARAMETER	SPIKE AMOUNT	MEASURED AMOUNT	UNITS	PERCENT RECOVERY	METHOD
Benzene	10.0	10.1	ug/L	101	SW846 8260B
tert-Butyl alcohol	50.0	53.7	ug/L	107	SW846 8260B
Ethanol	2000	2050 IO	ug/L	102	SW846 8260B
Tert-amyl methyl ether (T	10.0	9.63	ug/L	96	SW846 8260B
Ethyl-t-Butyl Ether (ETBE	10.0	10.0	ug/L	100	SW846 8260B
Ethylbenzene	10.0	10.4	ug/L	104	SW846 8260B
Diisopropyl Ether (DIPE)	10.0	10.1	ug/L	101	SW846 8260B
Methyl tert-butyl ether (MTBE)	10.0	9.43	ug/L	94	SW846 8260B
Toluene	10.0	10.1	ug/L	101	SW846 8260B
m-Xylene & p-Xylene	20.0	20.9	ug/L	104	SW846 8260B
o-Xylene	10.0	10.4	ug/L	104	SW846 8260B

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Bromofluorobenzene	96	(75 - 120)
1,2-Dichloroethane-d4	97	(65 - 130)
Toluene-d8	93	(80 - 130)

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

IO Contract limits originate from BP-GCLN Technical Requirements

LABORATORY CONTROL SAMPLE DATA REPORT

GC/MS Volatiles

Client Lot #....: E5A210247 Work Order #....: G3RD51AC Matrix.....: WATER
 LCS Lot-Sample#: E5B030000-565
 Prep Date.....: 02/03/05 Analysis Date...: 02/03/05
 Prep Batch #....: 5034565 Analysis Time...: 12:21
 Dilution Factor: 1 Instrument ID...: MSQ
 Analyst ID.....: 015590

PARAMETER	SPIKE AMOUNT	MEASURED AMOUNT	UNITS	PERCENT RECOVERY	METHOD
Benzene	10.0	9.35	ug/L	94	SW846 8260B
tert-Butyl alcohol	50.0	57.9	ug/L	116	SW846 8260B
Ethanol	2000	2530 IO	ug/L	126	SW846 8260B
Tert-amyl methyl ether (T	10.0	9.09	ug/L	91	SW846 8260B
Ethyl-t-Butyl Ether (ETBE	10.0	9.25	ug/L	92	SW846 8260B
Ethylbenzene	10.0	9.35	ug/L	94	SW846 8260B
Diisopropyl Ether (DIPE)	10.0	9.20	ug/L	92	SW846 8260B
Methyl tert-butyl ether (MTBE)	10.0	8.98	ug/L	90	SW846 8260B
Toluene	10.0	9.19	ug/L	92	SW846 8260B
m-Xylene & p-Xylene	20.0	18.9	ug/L	95	SW846 8260B
o-Xylene	10.0	9.31	ug/L	93	SW846 8260B

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Bromofluorobenzene	93	(75 - 120)
1,2-Dichloroethane-d4	123	(65 - 130)
Toluene-d8	97	(80 - 130)

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

IO Contract limits originate from BP-GCLN Technical Requirements

LABORATORY CONTROL SAMPLE DATA REPORT

GC Volatiles

Client Lot #...: E5A210247 Work Order #...: G3AQW1AC-LCS Matrix.....: WATER
 LCS Lot-Sample#: M5A270000-321 G3AQW1AD-LCSD
 Prep Date.....: 01/26/05 Analysis Date...: 01/26/05
 Prep Batch #...: 5027321 Analysis Time...: 09:44
 Dilution Factor: 1 Instrument ID...: GC1
 Analyst ID.....: 402431

PARAMETER	SPIKE AMOUNT	MEASURED AMOUNT	UNITS	PERCENT RECOVERY	RPD	METHOD
Methane	327	322	ug/L	98		RSK SOP-175
	327	319	ug/L	98	0.68	RSK SOP-175

NOTE (S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

LABORATORY CONTROL SAMPLE DATA REPORT

GC Volatiles

Client Lot #....: E5A210247 Work Order #....: G26QL1AC Matrix.....: WATER
 LCS Lot-Sample#: E5A250000-251
 Prep Date.....: 01/24/05 Analysis Date...: 01/24/05
 Prep Batch #....: 5025251 Analysis Time...: 22:58
 Dilution Factor: 1 Instrument ID...: G13
 Analyst ID.....: 001464

<u>PARAMETER</u>	<u>SPIKE AMOUNT</u>	<u>MEASURED AMOUNT</u>	<u>UNITS</u>	<u>PERCENT RECOVERY</u>	<u>METHOD</u>
GRO (C6 - C12)	1000	999	ug/L	100	SW846 8015B

<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
a,a,a-Trifluorotoluene (TFT)	117	(70 - 130)

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.
 Bold print denotes control parameters

LABORATORY CONTROL SAMPLE DATA REPORT

TOTAL Metals

Client Lot #...: E5A210247

Matrix.....: WATER

PARAMETER	SPIKE AMOUNT	MEASURED AMOUNT	UNITS	PERCNT RECVRY	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
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LCS Lot-Sample#: E5A240000-251 Prep Batch #...: 5024251

Iron	1000	1010	ug/L	101	SW846 6010B	01/24-01/25/05	G240T1AC
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Dilution Factor: 1 Analysis Time...: 17:21 Analyst ID.....: 021088

Instrument ID...: M01

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE DATA REPORT

General Chemistry

Client Lot #...: E5A210247

Matrix.....: WATER

PARAMETER	SPIKE AMOUNT	MEASURED AMOUNT	UNITS	PERCENT RECVRY	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Ferrous Iron	2000	2010	ug/L	100	SM18 3500-FE D	01/21/05	5021385
Work Order #: G227V1AC LCS Lot-Sample#: E5A210000-385							
Dilution Factor: 1 Analysis Time...: 12:30 Analyst ID.....: 021088							
Instrument ID...: W17							
Nitrate as N	5000	5040	ug/L	101	MCAWW 300.0A	01/21/05	5021304
Work Order #: G23ET1AC LCS Lot-Sample#: E5A210000-304							
Dilution Factor: 1 Analysis Time...: 20:15 Analyst ID.....: 000022							
Instrument ID...: W01							
Sulfate	25000	25200	ug/L	101	MCAWW 300.0A	01/21/05	5021305
Work Order #: G23EW1AC LCS Lot-Sample#: E5A210000-305							
Dilution Factor: 1 Analysis Time...: 20:15 Analyst ID.....: 000022							
Instrument ID...: W01							

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE DATA REPORT

GC/MS Volatiles

Client Lot #...: E5A210247 Work Order #...: G25LK1AC-MS Matrix.....: WATER
 MS Lot-Sample #: E5A240220-003 G25LK1AD-MSD
 Date Sampled...: 01/20/05 15:50 Date Received...: 01/21/05 19:10 MS Run #.....: 5034269
 Prep Date.....: 02/03/05 Analysis Date...: 02/03/05
 Prep Batch #...: 5034498 Analysis Time...: 08:10
 Dilution Factor: 10 Analyst ID.....: 000038 Instrument ID...: MSQ

PARAMETER	SAMPLE AMOUNT	SPIKE AMT	MEASRD AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD
Benzene	ND	100	104	ug/L	104		SW846 8260B
	ND	100	104	ug/L	104	0.67	SW846 8260B
tert-Butyl alcohol	ND	500	1150	ug/L	231 LM		SW846 8260B
	ND	500	1040	ug/L	207 LM	11	SW846 8260B
Ethanol	ND	20000	25000	ug/L	125 IO		SW846 8260B
	ND	20000	22800	ug/L	114 IO	9.0	SW846 8260B
Tert-amyl methyl ether (T	ND	100	89.2	ug/L	89		SW846 8260B
	ND	100	100	ug/L	100	11	SW846 8260B
Ethyl-t-Butyl Ether (ETBE	ND	100	95.8	ug/L	96		SW846 8260B
	ND	100	102	ug/L	102	6.1	SW846 8260B
Ethylbenzene	ND	100	107	ug/L	107		SW846 8260B
	ND	100	106	ug/L	106	1.2	SW846 8260B
Diisopropyl Ether (DIPE)	ND	100	98.9	ug/L	99		SW846 8260B
	ND	100	102	ug/L	102	3.3	SW846 8260B
Methyl tert-butyl ether	490	100	530	ug/L	36 BB		SW846 8260B
(MTBE)	490	100	600	ug/L	106	12	SW846 8260B
Toluene	ND	100	104	ug/L	104		SW846 8260B
	ND	100	104	ug/L	104	0.28	SW846 8260B
m-Xylene & p-Xylene	ND	200	212	ug/L	106		SW846 8260B
	ND	200	212	ug/L	106	0.42	SW846 8260B
o-Xylene	ND	100	104	ug/L	104		SW846 8260B
	ND	100	105	ug/L	105	1.0	SW846 8260B

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Bromofluorobenzene	98	(75 - 120)
	99	(75 - 120)
1,2-Dichloroethane-d4	106	(65 - 130)
	102	(65 - 130)
Toluene-d8	104	(80 - 130)
	102	(80 - 130)

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

Spiked analyte recovery is outside stated control limits.

LM MS and/or MSD above acceptance limits. See Blank Spike (LCS).

IO Contract limits originate from BP-GCLN Technical Requirements

BB Sample > 4X spike concentration

MATRIX SPIKE SAMPLE DATA REPORT

GC/MS Volatiles

Client Lot #....: E5A210247 Work Order #....: G219N1AJ-MS Matrix.....: W
 MS Lot-Sample #: E5A210247-009 G219N1AK-MSD
 Date Sampled....: 01/20/05 14:04 Date Received...: 01/21/05 10:30 MS Run #.....: 5034312
 Prep Date.....: 02/03/05 Analysis Date...: 02/03/05
 Prep Batch #....: 5034565 Analysis Time...: 19:02
 Dilution Factor: 1 Analyst ID.....: 015590 Instrument ID...: MSQ

PARAMETER	SAMPLE AMOUNT	SPIKE AMT	MEASRD AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD
Benzene	ND	10.0	8.54	ug/L	85		SW846 8260B
	ND	10.0	8.76	ug/L	88	2.5	SW846 8260B
tert-Butyl alcohol	ND	50.0	239	ug/L	478	LM	SW846 8260B
	ND	50.0	148	ug/L	295	47	SW846 8260B
	Qualifiers: BA, LM						
Ethanol	ND	2000	3730	ug/L	187		SW846 8260B
	Qualifiers: LM, IO						
	ND	2000	4230	ug/L	211	12	SW846 8260B
	Qualifiers: LM, IO						
Tert-amyl methyl ether (T	ND	10.0	9.07	ug/L	91		SW846 8260B
	ND	10.0	9.20	ug/L	92	1.4	SW846 8260B
Ethyl-t-Butyl Ether (ETBE	ND	10.0	9.04	ug/L	90		SW846 8260B
	ND	10.0	9.24	ug/L	92	2.2	SW846 8260B
Ethylbenzene	ND	10.0	8.36	ug/L	84		SW846 8260B
	ND	10.0	8.87	ug/L	89	5.9	SW846 8260B
Diisopropyl Ether (DIPE)	ND	10.0	8.93	ug/L	89		SW846 8260B
	ND	10.0	9.03	ug/L	90	1.1	SW846 8260B
Methyl tert-butyl ether	ND	10.0	8.95	ug/L	90		SW846 8260B
(MTBE)	ND	10.0	8.88	ug/L	89	0.78	SW846 8260B
Toluene	ND	10.0	8.14	ug/L	81		SW846 8260B
	ND	10.0	8.63	ug/L	86	5.8	SW846 8260B
m-Xylene & p-Xylene	ND	20.0	17.0	ug/L	85		SW846 8260B
	ND	20.0	17.8	ug/L	89	4.3	SW846 8260B
o-Xylene	ND	10.0	8.41	ug/L	84		SW846 8260B
	ND	10.0	8.90	ug/L	89	5.7	SW846 8260B

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Bromofluorobenzene	88	(75 - 120)
	87	(75 - 120)
1,2-Dichloroethane-d4	113	(65 - 130)
	115	(65 - 130)
Toluene-d8	89	(80 - 130)
	89	(80 - 130)

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MATRIX SPIKE SAMPLE DATA REPORT

GC/MS Volatiles

Client Lot #...: E5A210247
MS Lot-Sample #: E5A210247-009

Work Order #...: G219N1AJ-MS
G219N1AK-MSD

Matrix.....: W

<u>SURROGATE</u>	<u>PERCENT</u> <u>RECOVERY</u>	<u>RECOVERY</u> <u>LIMITS</u>
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NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

Spiked analyte recovery is outside stated control limits.

BA Relative percent difference out of control

LM MS and/or MSD above acceptance limits. See Blank Spike (LCS).

IO Contract limits originate from BP-GCLN Technical Requirements

MATRIX SPIKE SAMPLE DATA REPORT

GC Volatiles

Client Lot #....: E5A210247 Work Order #....: G219G1AJ-MS Matrix.....: W
 MS Lot-Sample #: E5A210247-007 G219G1AK-MSD
 Date Sampled...: 01/20/05 14:14 Date Received...: 01/21/05 10:30 MS Run #.....: 5025150
 Prep Date.....: 01/24/05 Analysis Date...: 01/25/05
 Prep Batch #...: 5025251 Analysis Time...: 03:09
 Dilution Factor: 1 Analyst ID.....: 001464 Instrument ID...: G13

PARAMETER	SAMPLE AMOUNT	SPIKE AMT	MEASRD AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD
GRO (C6 - C12)	ND	1000	801	ug/L	80		SW846 8015B
	ND	1000	814	ug/L	81	1.5	SW846 8015B

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
a,a,a-Trifluorotoluene (TFT)	118	(70 - 130)
	115	(70 - 130)

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

MATRIX SPIKE SAMPLE DATA REPORT

TOTAL Metals

Client Lot #....: E5A210247

Matrix.....: W

Date Sampled...: 01/20/05 13:48 Date Received...: 01/21/05 10:30

PARAMETER	AMOUNT	SAMPLE SPIKE AMT	MEASRD AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
MS Lot-Sample #: E5A210247-001 Prep Batch #....: 5024251									
Iron									
	366	1000	1330	ug/L	96		SW846 6010B	01/24-01/26/05	G218Q1AQ
	366	1000	1290	ug/L	92	2.7	SW846 6010B	01/24-01/26/05	G218Q1AR
Dilution Factor: 1									
Analysis Time...: 15:07 Instrument ID...: M01 Analyst ID.....: 021088									
MS Run #.....: 5024155									

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE DATA REPORT

General Chemistry

Client Lot #....: E5A210247

Matrix.....: W

Date Sampled...: 01/20/05 13:48 Date Received...: 01/21/05 10:30

PARAMETER	SAMPLE AMOUNT	SPIKE AMT	MEASRD AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
WO#: G218Q1AG-MS/G218Q1AH-MSD MS Lot-Sample #: E5A210247-001									
Ferrous Iron	ND	2000	2070	ug/L	104		SM18 3500-FE	01/21/05	5021385
	ND	2000	2080	ug/L	104	0.48	SM18 3500-FE	01/21/05	5021385
Dilution Factor: 1									
Analysis Time...: 10:16 Instrument ID...: W17 Analyst ID.....: 021088									
MS Run #.....: 5021204									
WO#: G218Q1AJ-MS/G218Q1AK-MSD MS Lot-Sample #: E5A210247-001									
Nitrate as N	4590	12500	16900	ug/L	99		MCAWW 300.0A	01/21/05	5021304
	4590	12500	16800	ug/L	98	0.93	MCAWW 300.0A	01/21-01/22/05	5021304
Dilution Factor: 1									
Analysis Time...: 23:17 Instrument ID...: W01 Analyst ID.....: 000022									
MS Run #.....: 5021216									
WO#: G218Q1AL-MS/G218Q1AM-MSD MS Lot-Sample #: E5A210247-001									
Sulfate	442000	312000	771000	ug/L	105		MCAWW 300.0A	01/21-01/22/05	5021305
	442000	312000	790000	ug/L	111	2.3	MCAWW 300.0A	01/21-01/22/05	5021305
Dilution Factor: 1									
Analysis Time...: 11:40 Instrument ID...: W01 Analyst ID.....: 000022									
MS Run #.....: 5021217									

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.